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Electrical World

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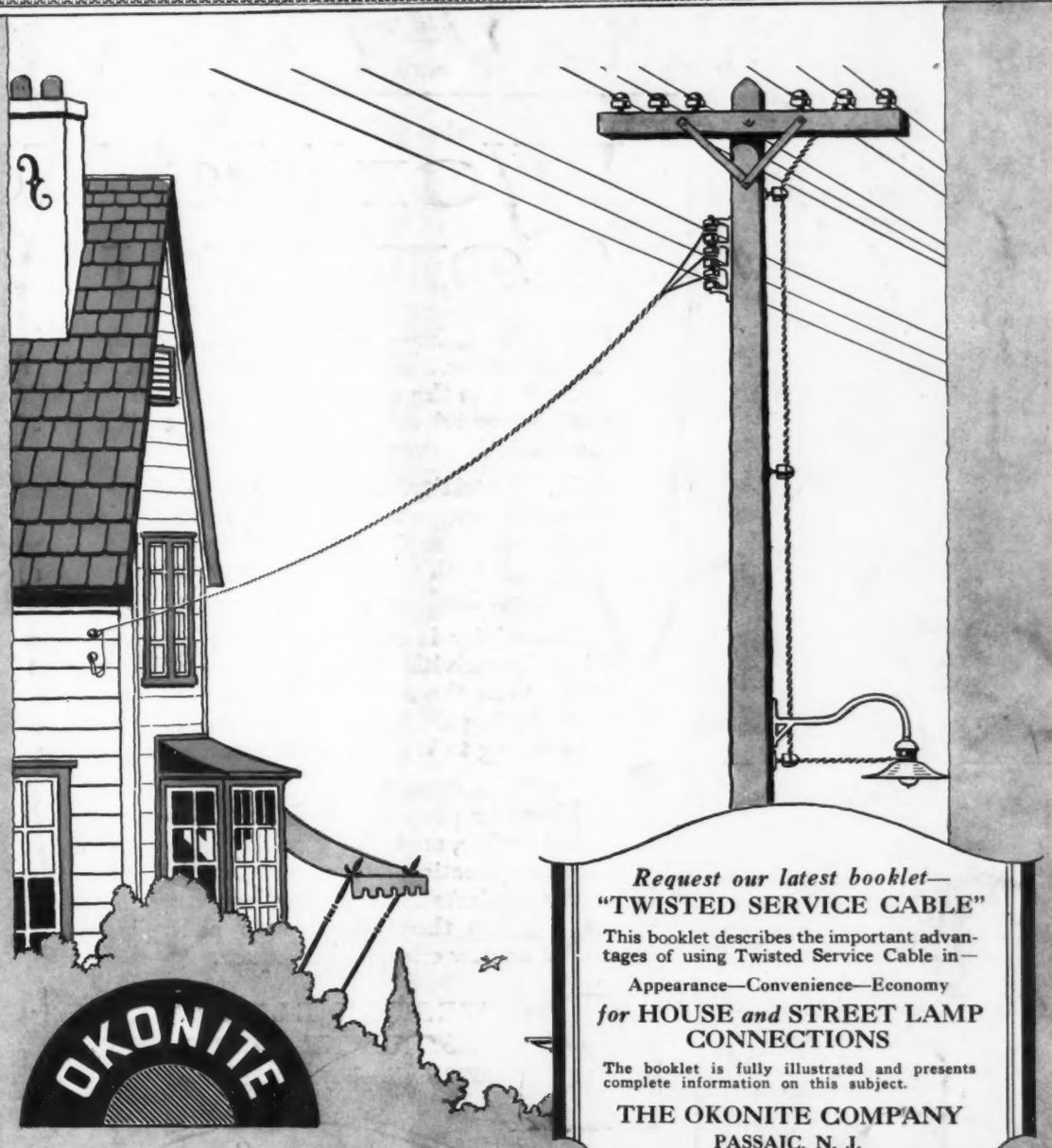

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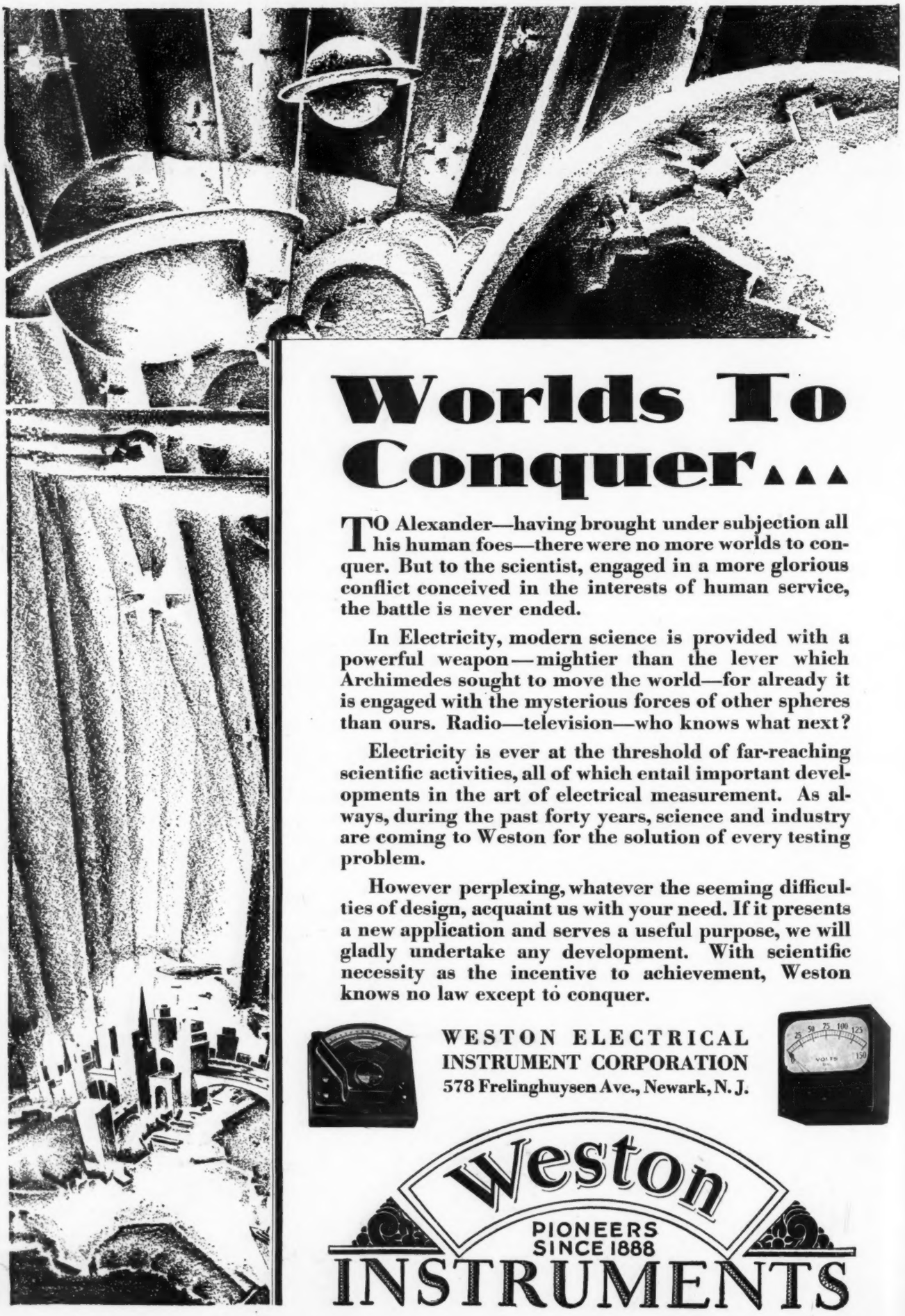

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McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th Street,
NEW YORK, N. Y.
Cable Address "Machinist, N. Y."

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WASHINGTON, National Press Building
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Publishers of
Electrical World
American Machinist
Electrical Merchandising
Engineering and Mining Journal
Chemical and Metallurgical Engineering
Bus Transportation
Power
Coal Age
Radio Retailing
Engineering News-Record
Electric Railway Journal
Ingeniería Internacional
Construction Methods
Food Industries
Electrical West
(*Published in San Francisco*)
American Machinist—European Edition
(*Published in London*)

SUBSCRIPTION PRICES: United States and its possessions, Canada, Mexico, and other countries taking domestic postage rates, $5 a year. All other foreign countries, $9 a year. Single copy, 25 cents. Published weekly. Entered as second class matter, Jan. 20, 1907, at the Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A.

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CHANGE OF ADDRESS
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Member Audit Bureau of Circulations.
Member Associated Business Papers.

Circulation of this issue, 18,400

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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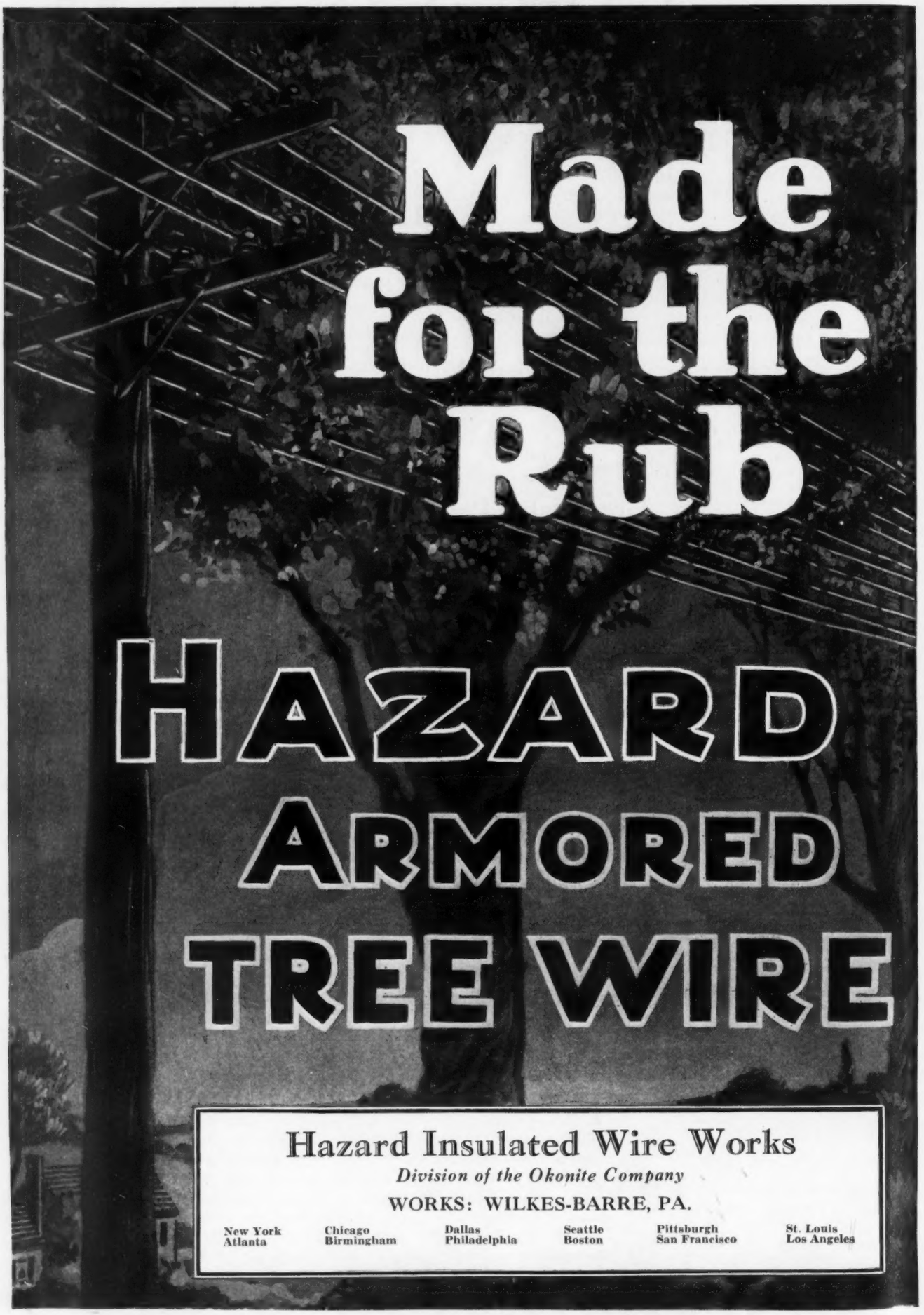
Bonbright Survey in Press

THE new fifth edition of the Bonbright Survey of Electric Light and Power Companies in the United States, now in press, constitutes a notable advance over its precursors. The number of companies for which financial statements are given has been materially increased, the lists of towns have been rearranged alphabetically for easy reference, rather than by size as heretofore, and a table of holding companies, with their subsidiaries, has been added. In addition, each subscriber is later to receive a record of utility purchases and mergers during 1928. The compilation was made by the statistical staff of the ELECTRICAL WORLD.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Electrical World

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Editor

VOLUME 92 — *New York, Saturday, November 3, 1928* — NUMBER 18

Progress in Human Engineering

IN A SPEECH on "Progress in Human Engineering" at a dinner tendered to pioneers of American industry on Oct. 24, Charles M. Schwab contrasted our extraordinary development in the production and distribution of goods, conveniences and material ideas with the slow progress we have made in human engineering. In Mr. Schwab's estimation, future pioneering will be done by great groups of trained men utilizing one another's scientific knowledge, rather than so much by the individual as has been the case in the past. He looks to organization and co-operation and to research for improvement in industry, and while changes are inevitable, he holds that the opportunities for pioneering in the future are beyond all limit.

To this era of machinery is due the remarkable progress we have made in t' ings material, and if progress in human engineering has not been so rapid, it is because we have exerted our driving force toward material gain. Consider, for example, the great consolidations which are taking place in the electrical industry. They make for progress and for better and cheaper service to the consumer. In the process, however, many men find themselves temporarily unhappy and some are displaced. It is the price of progress and part of the growing pains of a fast-advancing industry. But it is easy to overestimate the advantages of co-operation and of consolidation. Neither can make much headway without the individual to guide it along sane and profitable lines. Indeed, without a guiding genius the finest organization is about as useful as a ship without a rudder. It is futile, then, to ignore the individual. Leadership we must have, not in machinery but in human flesh and blood. Neglect of human relations leads to discontent, and discontent begets depression and panic.

Whenever and wherever opportunity presents itself in this country, there you will find individuals dedicating themselves and all they possess to its realization, the benefit accruing not to themselves alone but to multitudes of their fellows. That is the genius of America, and our salvation rests in encouraging individual enterprise while regulating monopolistic tendencies.

* * * *

Two Heads Are Better Than One

ENGINEERS are frequently confronted by problems that require for their solution special equipment, freshness in knowledge of theory and abundance of time, any or all of which may be lacking—or let us admit that the first and third items may be lacking and omit a discussion of number two as possibly controversial.

Technical colleges have much special apparatus suitable for research. Some at least of their students are eager to come to grips with reality, to exercise their ingenuity and to apply their knowledge; likewise some, if not all, of the faculty members want to give their more capable students every opportunity in that direction and are willing to devote much time and sincere effort to guiding them. Here, evidently, are two complementary conditions. Plainly, too, it is easier for the engineer who has a problem to solve and lacks the necessary equipment to bring it before a neighboring technical school than it is for the school to go out and find the problem. Examples of such co-ordination of effort might be drawn from any field of engineering, though they are not so common as they ought to be.

Not every problem lends itself to co-operative research. Some are too abstruse; some require only a study of existing technical literature—books, periodicals and society transactions; some come appropriately within the province of the consulting engineer. But the practitioner who does not on occasion get into touch with his neighboring technical school may be missing more than he realizes. He may be overlooking an opportunity for real service to the prospective members of his own profession, for making a useful contribution to technical progress and, quite possibly, for getting very material help on his own job.

* * * *

Dark Corners in Regulation

PROF. PHILIP CABOT of the Harvard Business School has written an arresting article for the November *Atlantic Monthly* under the somewhat inclusive title "Ethics and Politics." The author minces no words in spotlighting the political motives behind the present inquiry of the Federal Trade Commission into the power industry and back of the government-ownership propaganda of self-seeking publicists whose hands are here revealed at the old trade of reaching after jobs for the faithful. He sets forth the dangers of profit regulation by state commissions in place of rate regulation and declares that the government itself is responsible for the introduction of unethical defensive practices into the administration of some utility organizations.

Professor Cabot expresses disappointment with the work of the Federal Trade Commission, and in this he is not alone; but he wisely counsels awaiting the full report of that body before passing judgment. He points out that the promoters of the investigation appear to assume that the public will clamor for government ownership when the commission makes its finding, but that in this they may possibly be hoist with their own petard. The American people are overwhelmingly opposed to government interference with business, and unless an

aggressive minority succeeds in deluding the public, government owership of the light and power industry has small chance of adoption. Monopoly is a misnomer as applied to this industry, which is in acute competition with other means of service, and it is well that this is so ably made clear in this influential periodical, which has of late been rather hospitable to a good deal of ill-informed and destructive criticism of the electrical industry. Mr. Cabot well says that if the holding companies of this industry were managed by Machiavelli himself, it would be impossible for them to oppress the customers of the local companies because they have no contact with them and because the rates of the local companies are regulated by local or state authorities. On the contrary, holding companies are in a position to do their subsidiaries much good, and the splendid development of electric power production and use, in which the United States leads the world, is due in no small degree to their methods.

Unless capital enjoys the hope of reward for its work, progress as we know it in America will be severely handicapped. Therefore, any trend of state commissions to regulate profits instead of rates endangers the prosperity of the utility industry, so far as such a regulative policy is applied. The author has set a danger signal upon the track of state regulation which may well be heeded. Issue will doubtless be taken with Professor Cabot's criticism of state regulative policies, and others will regard his comments upon managerial ethics as unwarranted or overstressed; but the thoughtful reader can hardly fail to be impressed with his incisive analysis of present regulative tendencies.

* * * *

Will Research Also Provide the Key to Markets?

PRESTON S. ARKWRIGHT, president of the National Electric Light Association, in an address before the New York Electrical League last week made an observation that should set the leaders of the electrical industry to thinking. It is generally admitted that market development is now the urgent need. It is agreed that we are in a commercial era and that the immediate problem for electrical men is one of sales. But it is also evident enough that they today are biting at the cherry. They are selling single appliances to the home that needs complete electrical equipment. They are campaigning in the industrial and commercial markets, first with one specific application and then with another, when obviously the broader approach to every customer would be a study of the economic utilization of electric service to fit his individual needs. Such a theory naturally appeals to common sense. The question is how to accomplish it.

The electrical industry, Mr. Arkwright pointed out, has been able to make its tremendous contribution to social and economic progress because it was founded on scientific research. It has ever been led by the explorers of the laboratory, who, through research, have been able to push back the borders of the unknown. It is for this reason that the automobile and chemical industries have also forged to the front. They have substituted revolution by research for the old idea of evolution by slow experience. Adherence to this principle has made the achievement of the electrical engineer the marvel of the world. But the time has come, he said, when electrical men should set about the study of their commercial problems in the same orderly way.

If research will accelerate experience in engineering, so it will in the development of the art and science of market building. If research will bring accurate knowledge to the processes of construction and the operation of systems, so it will to the processes of sales. And since the public enjoyment of a broader service now depends on sales, the subject is certainly not unworthy of this more deliberate and painstaking development. Selling in the electrical industry has in the past been too much a matter of experiment sustained by great enthusiasm; and while the market has been growing faster than the sales, all has seemed well. But the industry cannot hope to travel forward on a wave forever. It suffers right now for want of a deeper knowledge of its market. Research points the way.

* * * *

A Civic Service

UTILITY executives and managers all over the country have been trying to make themselves useful in civic organizations and activities, not to pose as altruists or make a display of public spirit, but because they know their companies progress with the community.

One utility civic activity which has met with public as well as industrial appreciation was related recently by Bowen Tufts, chairman of the taxation committee of the New England Division of the N.E.L.A. It consists of graphing suggested public appropriations on the basis of dollars of taxation which will be imposed per $1,000 assessed valuation and showing how the major items will affect the unit tax rate. When attempts are made to put through additional appropriations, the result on unit taxes can be effectively demonstrated.

Every one is interested in keeping down taxes, and a utility following this practice cannot be accused of self-seeking, since it will only benefit with the rest. Furthermore, industries which are seeking new locations for branch factories or stores look with great favor on communities which keep down or reduce the tax rate. In thus serving its community as a whole a utility will not only benefit simultaneously with it but can increase that intangible asset—good will.

* * * *

Future of Railway Rectifiers

ALTHOUGH American manufacturers for many years showed comparatively little interest in the development of the mercury-arc rectifier for power applications, conditions have changed recently and this equipment is slowly but surely finding its place in the American railway substation. It is significant that the companies which have had rectifiers in operation for some time give every indication of being quite satisfied with the service and of their intention to install additional rectifiers in future substations.

One of the principal objections to the rectifier is that it requires auxiliary equipment, the uninterrupted operation of which is as important to the rectifier operation as are the steam-plant auxiliaries to turbine operation. But experience does not seem to record any great difficulties in maintaining good service on these auxiliaries even in automatic rectifier stations. Telephone and radio interference troubles caused by rectifier operation are

now being subjected to careful study and will no doubt soon be eliminated. The fact that rectifiers require a water supply for cooling purposes will make it economically impossible to use them in many outlying railway substations where a water supply can only be made available at great expense. But in city and suburban substations, particularly where the units are not rated above 1,000 kw. or 2,000 kw., rectifiers can be and have been successfully used.

The recent detailed report before the A.I.E.E. about the satisfactory operation of a number of rectifier stations for trolley purposes in Connecticut deserves the serious consideration of engineers. It is claimed that rectifiers require less attention than rotaries, that they take much less time to start, that the correct division of load among the various units is accomplished automatically, that voltage regulation is little more than 5 per cent between no load and full load, and that the maintenance cost is lower than on rotaries. If these claims shall be substantiated, the rectifier will no doubt become quite popular for certain applications in the near future, since it is generally recognized that it offers a great economy in space. The rectifier offers promise for many applications in railroad electrification and will be joined with motor-generators and rotaries to solve industry rectification problems.

* * * *

Electric Heating Cannot Be Sold Like Mousetraps

WHEN electric heating became an important manufacturing tool ten or twelve years ago it produced many far-reaching effects, changing not only heat-treating processes but also the nature of equipment used. At that time industrial gas as a fuel was rapidly attaining its ascendency over oil. Then came the electric furnaces and ovens with their many advantages over either gas or oil and the battle seemed won by the electrical industry. But the industrial gas men took a few leaves out of the electrical industry's book and started making technical improvements on their equipment. Through the use of electrically operated apparatus they obtained more accurate temperature control. Problems of combustion were tackled and the deleterious effect of gases on products was partly remedied. Other refinements were made in fuel-fired ovens and furnaces so that they might approach more clearly the desirable characteristerics of the electrical equipment.

So far fuel-fired industrial heating equipment has been able only to approach the degree of perfection in performance found in electrical equipment. Because of this the electrical industry, or some parts of it at least, seemingly has fallen into the complacent belief that the inherent advantages of electricity over fuel are insurmountable. The gas men, however, have not stopped at making technical improvements in their equipment. They have gone forward in a most practical manner to organize and carry out a national industrial gas sales program which is familiar to every utility man—gas or electric.

Now, it has been said that if a man build a better mousetrap than his neighbor, the world will make a beaten path to his door, even though he live in the woods. A pleasing thought! Perhaps that is the way the electric utilities feel about industrial electric heating. But electric furnaces are not mousetraps, and the production manager of an industrial plant has neither time nor inclination to drive up side roads looking for the solution of his heat-treating problems. He is already being bombarded with the alleged virtues of fuel-fired equipment.

The electrical industry has a big stake in the industrial heating load and it cannot afford to let it go by default. Much research and development work has been done, but no definite sales program has ever crystallized. It would seem, therefore, that the electrical industry might profitably take a page from the gas industry's book and set up a sales policy and publicity program looking to the building up of the industrial electric heating load. This is needed now, not next year or the year after.

* * * *

Standardization in Manhole Equipment

VIRTUALLY every manufacturer of manhole equipment has his own standard for hangers, terminal arrangements and methods of connecting cable to apparatus, including studs, stuffing boxes and wiping nipples. If the manufacturers and operating companies could agree on standard terminal arrangements, including the method of attaching the cables to the equipment, operating and maintenance problems would be materially reduced. It would be possible to replace one type of equipment with another simply by interchanging the terminals. There would be no delay for wiping new nipples onto the cable. As a result both the cost of doing the work and the time of service interruption would be reduced.

Another value of this type of standardization would be the greater freedom of competition permitted among manufacturing companies. At present many operators standardize on one type of equipment simply to obtain flexibility in operating and maintenance work. If several types of apparatus are purchased, the operator must either sweat new wiping nipples onto the cables each time equipment is changed or stock each type of equipment and suffer the attendant carrying charges. In either case sufficient records must be maintained to insure that apparatus will be replaced by equipment of the same type.

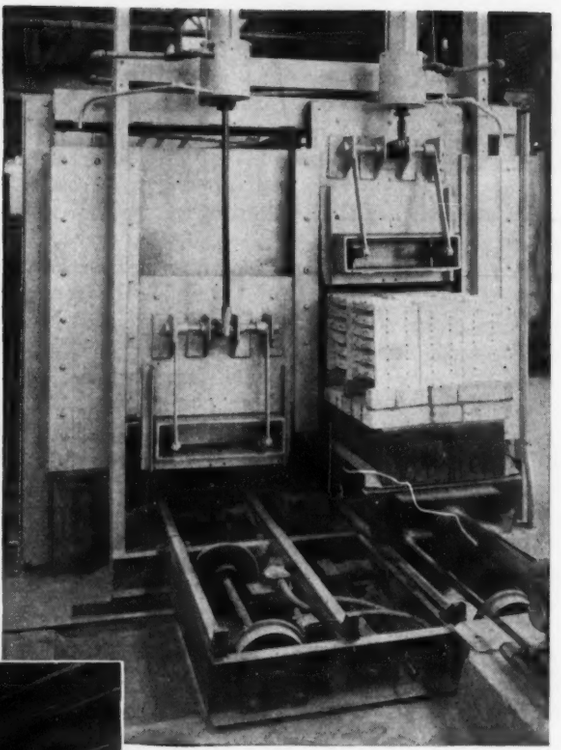
Similar advantages will accrue from standardization of hangers for network switches, oil switches, fuses and junction boxes. Standardization of the elements mentioned should not influence the actual design of the equipment and consequently would not restrict development. Limiting transformer dimension might also be considered for standardization, because a manufacturer will frequently change the dimensions of manhole transformers to an extent where they cannot be installed in existing manholes.

To bring about such standardization both the manufacturing and operating companies must enter into an analysis of the situation with a real spirit of co-operation. It is believed that the operating companies will agree to any reasonable standardization provided assurance is given that the standards will be more or less permanent. At least, the manhole-equipment sub-committee of the N.E.L.A. underground systems committee is organized to consider the subject.

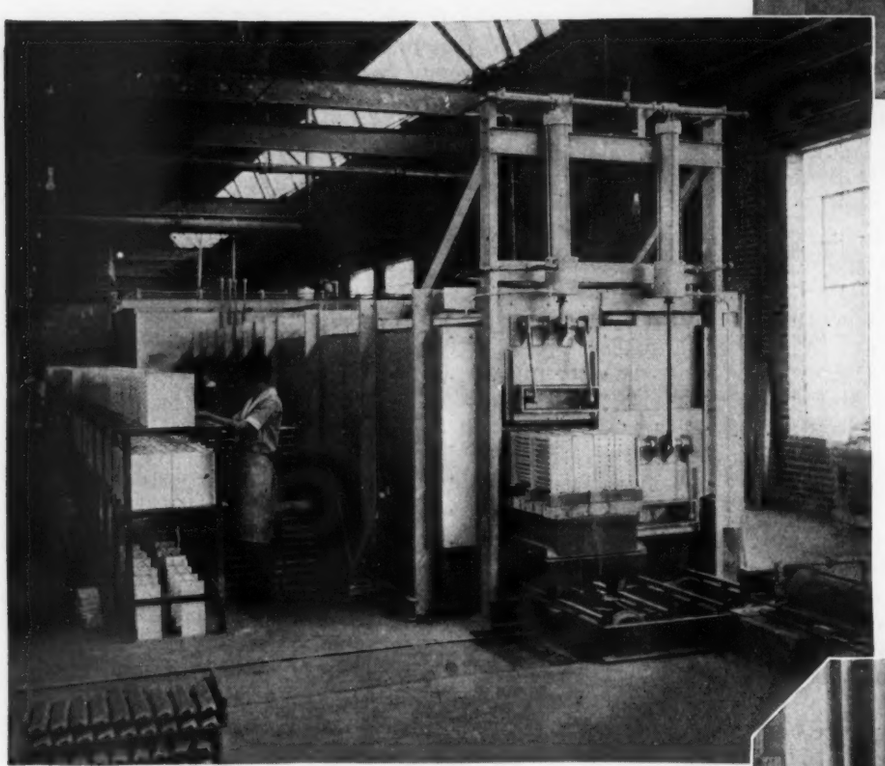
If something can be done to alleviate the situation, a distinct saving will accrue to the industry as a whole, and for this reason the subject deserves the support of both the manufacturing and operating interests.

Ceramic Firing with Electric Heat

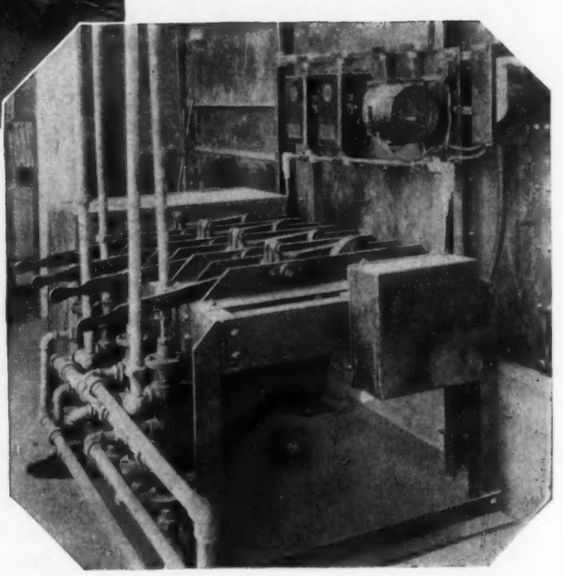
THE installation of an electrically heated kiln of 150 kw. capacity at the plant of the Robertson Art Tile Company, Trenton, N. J., is one of the first applications of electric heat in the ceramic industry. Not only satisfactory results but highly gratifying economies are reported to have been obtained.



Loaded cars are moved through kiln by means of a hydraulic pusher which moves the entire line of cars.



The complete cycle of preheating, final heating and cooling for colored, glazed finish decorative tile requires 21 hours in this 100-ft. electric kiln, as against five to eight days in the ordinary fuel-fired periodic kiln.



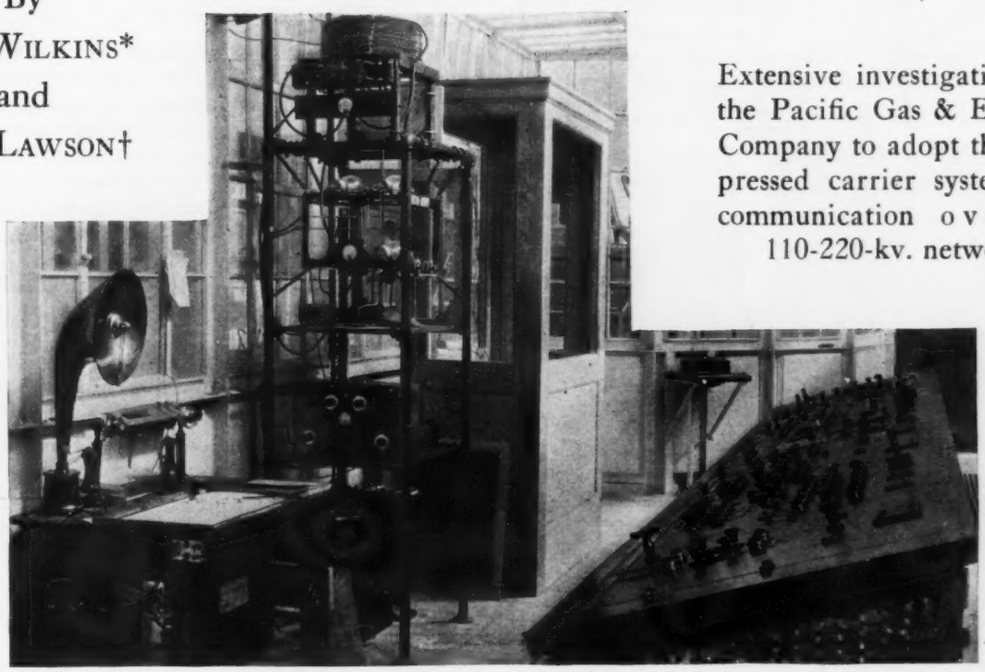
Automatic control incorporates timer and motor-driven valves.

Single Side-Band Carrier

for Interstation Communication

By
ROY WILKINS*
and
F. I. LAWSON†

Extensive investigation led the Pacific Gas & Electric Company to adopt the suppressed carrier system for communication over its 110-220-kv. network



Original simplex carrier telephone set at Pit No. 1 power house

ONE of the major problems in the operation of modern transmission networks is that of securing adequate communication. This has been especially emphasized during the last five years due to the economic tendency toward higher voltages and longer lines. The cost of a 220-kv. line is approximately twice that of a 110-kv. line, but it will transmit four times the power for a given distance. Where sufficient power is available to load the 220-kv. lines their use becomes inevitable now that engineering technique has advanced to a point where transmission at this voltage is practicable. With power in amounts of this order it becomes essential that the dispatching centers be kept in adequate communication with the power sources at all times, both for the normal changes in load and switching and for direction in cases of trouble. The Pit River development of the Pacific Gas & Electric Company presented such a problem when it was put in service some six years ago.

Originally a telephone line was constructed along a separate right-of-way about a mile from the power line. Hard-drawn No. 8 copper wire was used and the best telephone practice with respect to poles, insulators, crossarms, etc., was followed. Since this telephone line traverses heavily timbered mountainous country, with considerable snowfall at times, it has been impossible to keep it in continuous operation. The power line, on the other hand, is of considerably heavier construction and is built on steel structures with a much wider right-of-way, with the result that interruptions are rare and momentary. Communication over such a line should be more reliable provided the communication equipment itself is not too sensitive to the circuit changes which necessarily occur on a power system.

As an additional channel for communication to the Pit River plant there was considered: (1) Space radio telegraph; (2) space radio telephone; (3) carrier-current telephone.

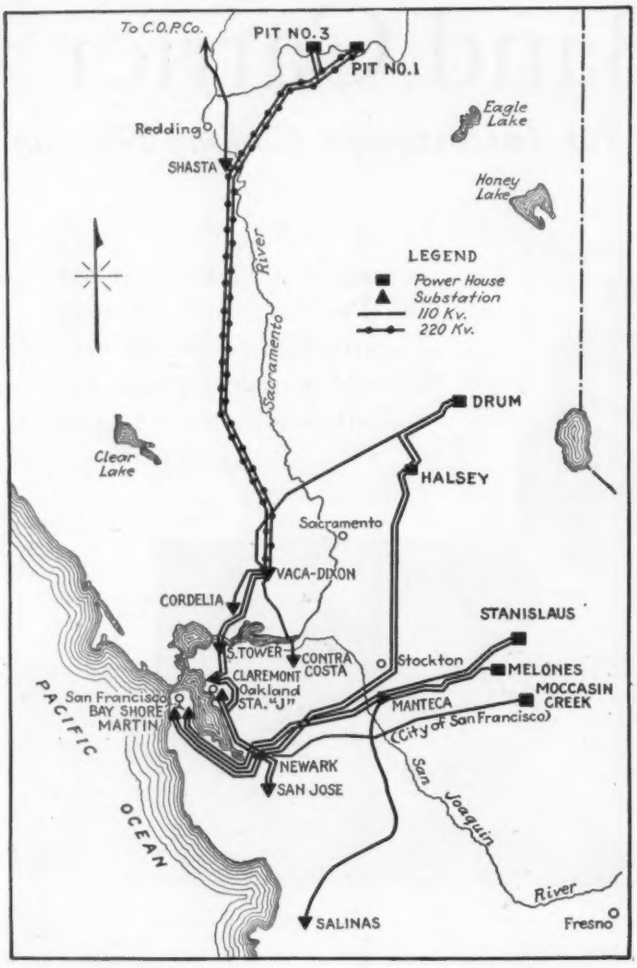
The two first were dropped on account of the operating difficulties, particularly with regard to licensing operators and the requirement that an operator always be on duty at the set. Furthermore, in order to secure reliable communication an abnormally large set would have been required and interference difficulties encountered.

ORIGINAL CARRIER INSTALLATION

The carrier telephone sets originally installed were built on the job from available parts, using a standard connection, simplex operation and antenna coupling, and had a nominal rating of 500 watts. The original installation was on the 202 miles of 220-kv. circuit from Pit No. 1 to Vaca-Dixon while it was temporarily operating at 110 kv. and was described by E. A. Crellin in the *A.I.E.E. Journal* for December, 1923.

At this time there was connected metallically, without transformation, about 1,000 miles of 110-kv. line, the 202 miles being an extension not otherwise connected to the network. The reliability of the original carrier installation was better than the wire line, but the speech quality was poor and, due to the simplex operation, the dispatching speed was low. After the 202-mile Pit No. 1 Vaca-Dixon section had been in operation some time, a third terminal was installed at Claremont substation in

*Consulting engineer Pacific Electric Manufacturing Company, formerly with Pacific Gas & Electric Company.
†Assistant engineer division of hydro-electric and transmission engineering, Pacific Gas & Electric Company.



Map of 110-kv. and 220-kv. transmission system of Pacific Gas & Electric Company

Oakland, with the intention of talking direct to Pit No. 1 from the load dispatcher's office over a 5-mile telephone cable extension to Claremont, thence 49 miles over 110-kv. line to Vaca-Dixon substation and 202 miles to Pit No. 1, which latter was at that time also operated temporarily at 110 kv. This set was a duplicate of the original two using antenna coupling. With the Pit-Vaca lines operating at 110 kv. there was an uninterrupted metallic connection from Claremont to Pit No. 1, the 50,000-kva. transformer banks at Vaca-Dixon being connected only on the 110-kv. tap. These transformers are Y-connected auto-transformers, 220 kv. to 110 kv., with an 11,000-volt delta-connected tertiary on which the synchronous condensers are operated.

The Claremont set was never a success for through transmission. It was perfectly satisfactory from Claremont to Vaca, but switching conditions caused so much variation that the Claremont-Pit circuit could not be used without retuning after any switching had taken place. When the voltage was changed to 220 kv. from Pit No. 1 to Vaca the noise increased greatly, the quality of received signal was much poorer and the dispatching requirements increased. The channel from Claremont to Pit. No. 1 was practically inoperative except as two channels with a manual repeat at Vaca-Dixon. This was apparently caused by several conditions, among which were the increased noise and the difficulty of getting out of the 110-kv. network and through or around the transformers at Vaca with sufficient energy to reach to Pit No. 1. The quality suffered due to the general high noise level and also on account of modulation caused by the varying characteristics of the line during a single voltage cycle. (See paper by Wolfe and Sarros, 1928 Pacific Coast convention, A.I.E.E.)

Nature of Carrier Problem

Early in 1924 it was decided to gather the necessary data to make recommendations for the improvement in this carrier channel, embodying, if possible, a recommendation for the entire future carrier network on the system. The channel from Claremont to Pit No. 1 was chosen for trial because it was believed to be a particularly difficult problem from the communication standpoint:

First—The 49 miles of 110 kv. is a part of an 1,100-mile network of 110-kv. lines and equipment with a variety of possible circuit and equipment arrangements and which in normal operation contains several loops and branches.

Second—The operating procedure demands widely varying line and switching conditions.

Third—The 202 miles of 220-kv. line has normally about 2,500 kw. corona loss and is very noisy, measured by communication standards.

Fourth—Difficulty was always encountered in getting out of the 110-kv. network and into the 220-kv. lines with sufficient energy to be received at Pit No. 1 above the usual noise level. Due to the established positions of the power phases on the twin circuit tower line, difficulty was also encountered in securing efficient coupling to the desired power conductors because the positions available for the coupling antenna gave substantially equal coupling to conductors of opposite polarity in the carrier circuit. This finally led to the abandonment of antenna coupling and the adoption of condenser coupling.

The condensers used are a dry type, porcelain insulated, and are built in units similar to one-part pin-type insulators with enlarged caps and pin thimbles, which form the plates of the condensers. Three units in series and three of the series groups in parallel are used on each leg of the 110-kv. coupling, while six units in series and six groups in parallel are used on the 220-kv. coupling, giving a capacity between line and carrier lead equal to the capacity of a single unit for either case.

The insulating value for the condensers is very materially above that of either the lines or the connected apparatus, both with regard to 60-cycle and impulse

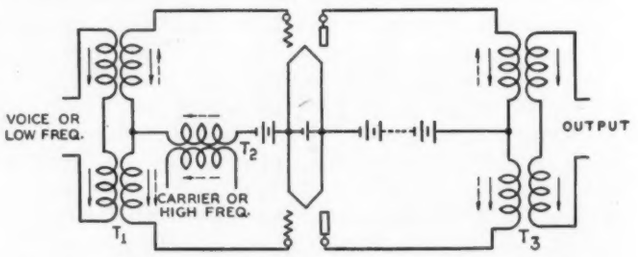


Diagram of a balanced or push-pull modulator

flashover, which minimizes the danger of a high-tension failure entering the communication equipment.

The coupling condensers are connected to two phases of the high-tension bus at each of the three stations and the connections to the bus were so chosen as always to be available for a through connection with the power circuit. At Vaca-Dixon substation two sets of coupling equipment (coupling condensers and coupling filters) are required, one for the 110-kv. connection and one for the 220-kv. The by-pass around the 110-220-kv. auto-

transformers is made by connecting the tap on the 110 kv. with that on the 220 kv., the Vaca-Dixon terminal set being bridged across the tie.

Once the desirable coupling was decided upon and installed, the problem reduced itself to a communication problem over a very noisy channel with widely varying characteristics. On such problems a great deal of work had already been done, both on long-distance toll circuits using carrier current and on space radio as applied to the transatlantic telephone. Wire extensions and like problems had already been solved in other fields, and a considerable portion of the needed equipment was in production on a quantity basis for other uses. Its use had already become standard in communication work and its reliability was unquestioned.

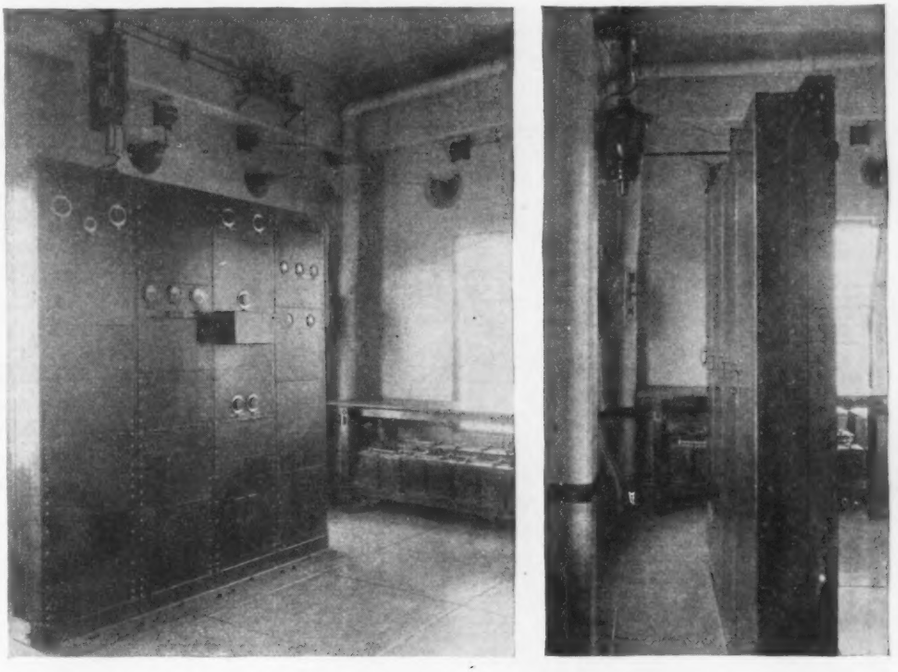
Single Side-Band Carrier

The final solution of the problem utilizes a carrier system which transmits but one side band. The carrier wave itself, along with the other side band, is eliminated in the transmitter. This single side band is produced by a process of double modulation. Ordinarily modulation involves the process of combining a voice frequency current with the higher frequency carrier current, which yields a "modulated carrier" wave, the familiar radio broadcast wave. This modulated carrier contains component frequencies of both the sum and difference of the carrier and voice frequencies. The carrier plus the varying voice frequency makes up the "upper side band" and the carrier minus the varying voice frequency forms the "lower side band" of frequencies, all of which are present in the broadcast wave.

Certain advantages in transmission occur when the carrier and one side band are eliminated, which can be done by balancing out the carrier in a push-pull arrangement or balanced modulator as shown in an accompanying illustration. In the balanced modulator the voice frequency is applied differentially to the two grids through the transformer T_1, while the carrier frequency is applied through the transformer T_2 and the midpoint of T_1 in such a manner that the grid potential of the two tubes is increased and decreased simultaneously. The effect of this plan, at the output terminals, is to amplify the voice frequency impulses as modulated by the carrier, both side bands appearing at the terminals, the carrier itself being balanced out in the output transformer T_3. Either of the side bands can be eliminated in a suitable filter. To carry out the process efficiently and overcome the difficulty of filtering side bands very close to each other in frequency range the same process of modulation is repeated before the signal is finally amplified and transmitted.

In receiving, the process of building up the signal to a reproduction of the transmitted voice frequency is just the opposite of that used in modulation. A carrier wave is introduced from a local oscillator, which, with the addition of the incoming side band, produces a wave having both upper and lower side bands, from which the voice frequency can be derived by any one of the several methods of detection.

By demodulating the transmitted wave with the same carrier frequencies that are used in transmission, simplification of the apparatus is obtained. These principles of carrier transmission are not new, but have been used in telephone practice for many years, and again more recently in the transatlantic radio telephone circuit.*



Front view of one of the terminal equipments and rear view of the terminal panels

Some of the advantages obtained by a single side-band transmission are:

1. Increased efficiency due to the fact that all the intelligibility of the message is present in the side band, with one-fifth of the power requirements of transmission involving carrier and both side bands. Smaller power requirements mean lower plate voltages and simplified apparatus.
2. The necessary frequency band for the channel is narrower, resulting in more uniform transmission, with less susceptibility to interference and natural disturbances.
3. The system yields readily to methods of duplexing, i.e., automatic thrower from sending to receiving, because there is no output from the transmitter so long as there is no voice frequency input to the modulator.

Operation of Equipment

The accompanying block schematic diagram gives an outline of the operation of the equipment in transmitting and receiving. The voice frequencies which originate in the operator's telephone set or at the load dispatcher's extension are transmitted through the voice frequency hybrid panel into the transmitter. This hybrid panel serves primarily to prevent received signals from operating the transmitter. The first modulator consists of a 28.6-kilocycle oscillator and a balanced

**Colpitts and Blackwell, "Carrier Current Telephony and Telegraphy," Transactions A.I.E.E., Vol. XL (1921), pages 205-296. R. A. Heising, "Production of Single Side-Band for Transatlantic Radio Telephone," Proceedings I.R.E., June, 1925.*

modulator of the type described above. Modulated with voice frequencies the upper and lower side bands are then in the range from 29 to 32 kilocycles and 28 to 25 kilocycles, respectively. The upper side band is eliminated in the band pass filter and the lower side band then used as the modulating frequency in the second modulator. Here the carrier frequency is adjustable over a fairly wide range to suit transmission line characteristics, the particular frequency used being one which yields a lower side band of about 60–63 kilocycles. It is to be noted that the suppression of the carrier and elimination of the unwanted side band all takes place at low energy levels, and the amplification is the last step performed before the output is coupled to the transmission line through the coupling filter, one part of which is formed by the coupling condensers.

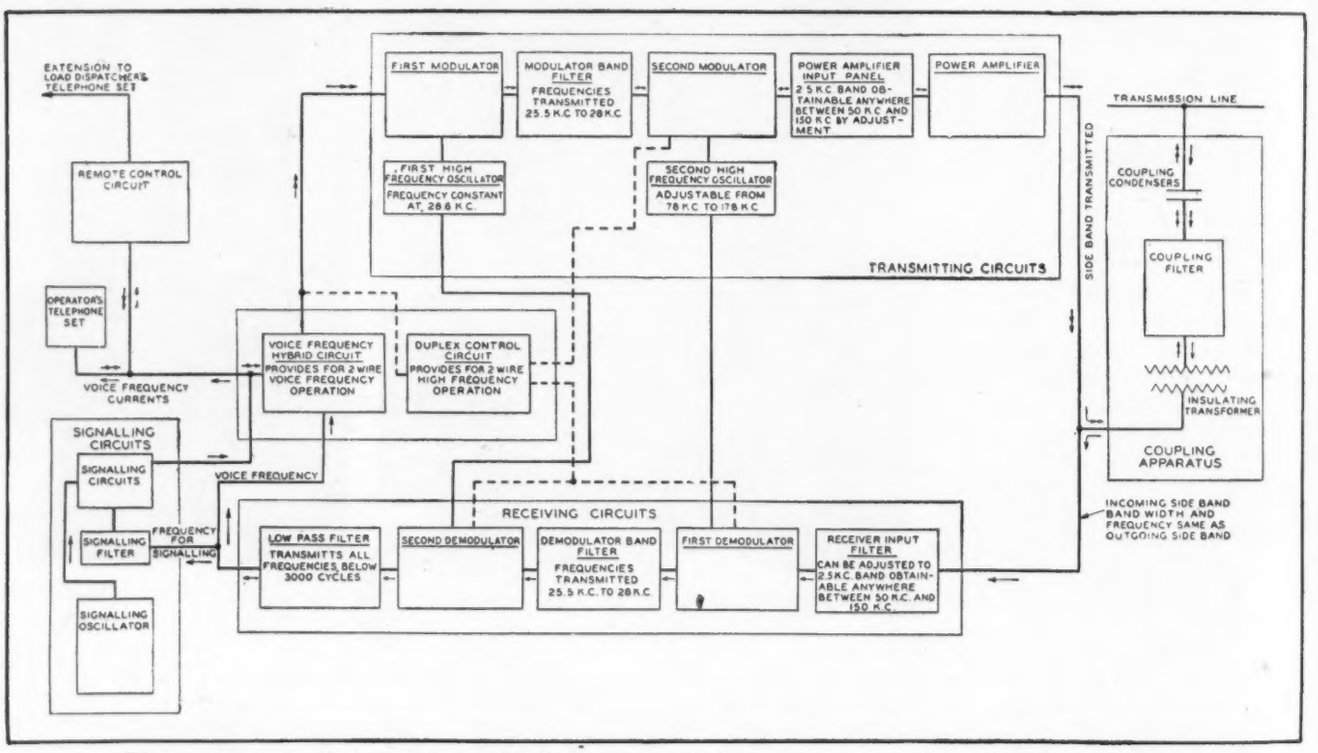
In receiving the call, the high-frequency currents are received through the same coupling filter and introduced into the receiving equipment, where demodulation takes place in steps similar to those used in modulation, except that they are performed in the reverse order. Since the same frequency is used for transmission in both directions, the demodulators use the same carrier frequencies as the modulators, and the modulator oscillators are therefore used to supply carrier frequency to the demodulators as well.

In order to operate any practical duplex carrier communication system on the same frequency, it is necessary to provide some means of control whereby the transmitter can be rendered inoperative when not in use and the receiver made inoperative while the transmitter is in use. This is accomplished by means of the duplex control which incorporates vacuum tube relaying to impress a high negative blocking bias on the second modulator tubes at all times except when a voice frequency impulse is sent into the transmitter, and impresses a high negative bias on the demodulator tubes when such an impulse is being transmitted. This control is sufficiently effective to permit the transmitter and receiver to be connected directly in parallel, the latter being unharmed by the fairly high voltage impressed on its terminals during transmitting periods.

Signaling is accomplished by means of standard train-dispatching selector equipment and 1,600-cycle impulses, with suitable relays to operate a call bell at each terminal. The load dispatcher's extension consists of full remote control of the Claremont terminal over two wires, without the use of vacuum-tube circuits at the load dispatcher's office. Similar extensions are made at will on the Pit end of the circuit by simply switching onto the privately owned local circuits, the only requirement being that good telephone volume and quality be available.

The filament current is obtained from 24-volt storage batteries operated on trickle charge from the station bus through a rectifier. Plate power is supplied by transformers and tube rectifiers, also from the station bus, at 110 volts, 60 cycles. Eventually, if it proves desirable, a small 110-volt, 60-cycle alternator driven by a direct-current motor on the station control battery will be installed as an emergency source of 110-volt alternating-current power.

During the several years' work on the carrier problem the high-voltage rectifier showed decided maintenance advantages over motor-generators for the same service; the reliability was higher and the control better. As installed, the 110 volts is stepped up by transformer, rectified, filtered and automatically regulated by an ingenious regulator having no moving parts, before it is applied to the several plate circuits. The terminal equipment is built up in units, each of which has a particular function to perform. The apparatus for each unit is mounted on a separate steel panel, the panels


EXTENSION TO LOAD DISPATCHER'S TELEPHONE SET
REMOTE CONTROL CIRCUIT
OPERATOR'S TELEPHONE SET
VOICE FREQUENCY CURRENTS
FIRST MODULATOR
MODULATOR BAND FILTER
FREQUENCIES TRANSMITTED 25.5 K.C. TO 28 K.C.
SECOND MODULATOR
POWER AMPLIFIER INPUT PANEL
2.5 K.C. BAND OBTAINABLE ANYWHERE BETWEEN 50 K.C. AND 150 K.C. BY ADJUSTMENT
POWER AMPLIFIER
FIRST HIGH FREQUENCY OSCILLATOR
FREQUENCY CONSTANT AT 28.6 K.C.
SECOND HIGH FREQUENCY OSCILLATOR
ADJUSTABLE FROM 78 K.C. TO 178 K.C.
TRANSMITTING CIRCUITS
VOICE FREQUENCY HYBRID CIRCUIT
PROVIDES FOR 2 WIRE VOICE FREQUENCY OPERATION
DUPLEX CONTROL CIRCUIT
PROVIDES FOR 2 WIRE HIGH FREQUENCY OPERATION
SIGNALLING CIRCUITS
SIGNALLING CIRCUITS
SIGNALLING FILTER
FREQUENCY FOR SIGNALLING
SIGNALLING OSCILLATOR
VOICE FREQUENCY
RECEIVING CIRCUITS
LOW PASS FILTER
TRANSMITTS ALL FREQUENCIES BELOW 3000 CYCLES
SECOND DEMODULATOR
DEMODULATOR BAND FILTER
FREQUENCIES TRANSMITTED 25.5 K.C. TO 28 K.C.
FIRST DEMODULATOR
RECEIVER INPUT FILTER
CAN BE ADJUSTED TO 2.5 K.C. BAND OBTAINABLE ANYWHERE BETWEEN 50 K.C. AND 150 K.C.
SIDE BAND TRANSMITTED
TRANSMISSION LINE
COUPLING CONDENSERS
COUPLING FILTER
INSULATING TRANSFORMER
COUPLING APPARATUS
INCOMING SIDE BAND BAND WIDTH AND FREQUENCY SAME AS OUTGOING SIDE BAND

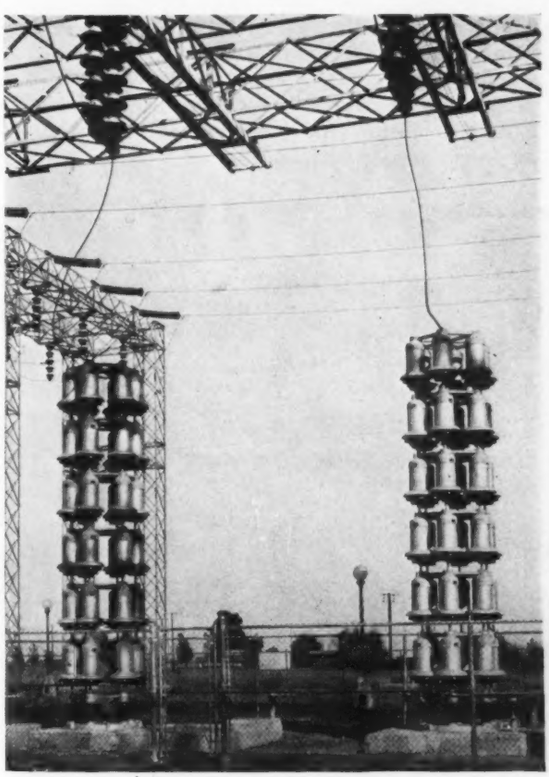
Block schematic diagram of the single-frequency duplex power line carrier telephone equipment, employing single side band suppressed carrier transmission

being mounted on standard channel iron switchboard frames. The meters and test jacks, and a few controls, are the only items appearing on the front of the boards and the backs are inclosed with locker-type doors, as shown in accompanying illustrations.

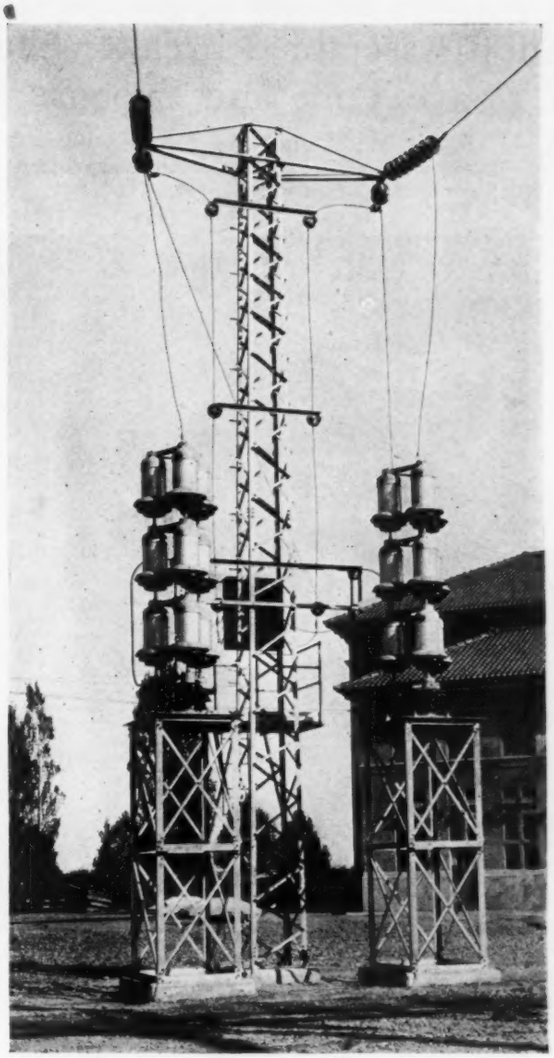
The installation was designed by the Bell Telephone Laboratories and the terminal equipment was built by the Western Elecric Company. The coupling condensers are of Ohio Brass Company manufacture.

Operating Reliability

In addition to the extensive tests carried on during the investigation, the equipment has, since being installed, been subjected to a number of tests to determine its characteristics and limitations as a communication channel in the power network described; i.e., to determine how well it meets the requirements imposed. Sections of the parallel lines which form its normal path were isolated and grounded in various combinations and the effect of this noted in the performance of the carrier communication channel. In general, it may be said that whenever there is a through power circuit, a reliable through carrier circuit is also available. Switching on a neighboring circuit, even though strung on the same towers as the circuit in use, has but little, if any, noticeable effect on the carrier channel. Opening all of the power circuits between station buses, however, opens the carrier circuit also, though instances are on record in which a fair degree of communication has been obtained around open switches, probably due to some degree of coupling between lines or circuits. On the 220-kv. section the removal of one of the circuits tends to improve the carrier channel due to the lessening of the interfering noise. Voltage changes over quite a wide range have no noticeable effect on the carrier.



220-kv. coupling condensers



110-kv. coupling condensers and filter coil box

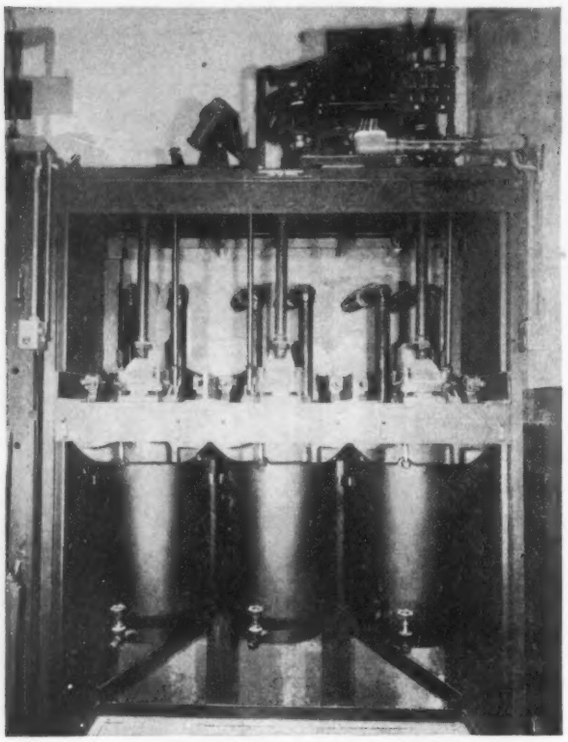
The 110-kv. network was also set up to indicate how the carrier energy permeates to the extremities of the network by routing the carrier from Claremont to Vaca-Dixon by way of Newark, Halsey Junction and Drum, a loop of approximately 250 miles length, the greater part of which forms but one of four extensive 100-kv. branches radiating from Newark. This was accomplished by putting the carrier condensers at Vaca on the same bus with the Vaca-Drum line and isolating this bus from the rest of the 110-kv. circuits at Vaca. With the Vaca-Drum line open at Vaca, there was insufficient coupling between the buses at Vaca to make the carrier operative. Closing the circuit to Drum brought sufficient carrier energy in from this branch of the network to provide satisfactory communication around the loop.

The present installation of three terminals, with the load dispatcher's extension, has been in continuous service, permanently installed now, for about three months, during which time no adjustment or maintenance has been necessary.

While the theory and circuit diagrams have gone through many complexities, the present equipment is fairly simple in its details, and the physical assembly is quite rugged, a course of development followed by practically all electrical devices.

Shop-Assembled Breaker Units Save Time and Expense

By J. W. Young* and E. J. Clark
Byllesby Engineering & Management Corporation, Pittsburgh Branch



Steel cell breaker unit immediately after installation

OIL circuit breakers of high interrupting capacity for operation at 22,000 volts and mounted in all-steel cell structures have recently been installed in a substation of the Duquesne Light Company. These units replaced breakers of lighter interrupting capacity in existing concrete-type coil structures which were not large enough to accommodate the new breakers. The object of adopting the completely assembled unit was twofold:

1. Limited space conditions.
2. Reduction of outage time for installation.

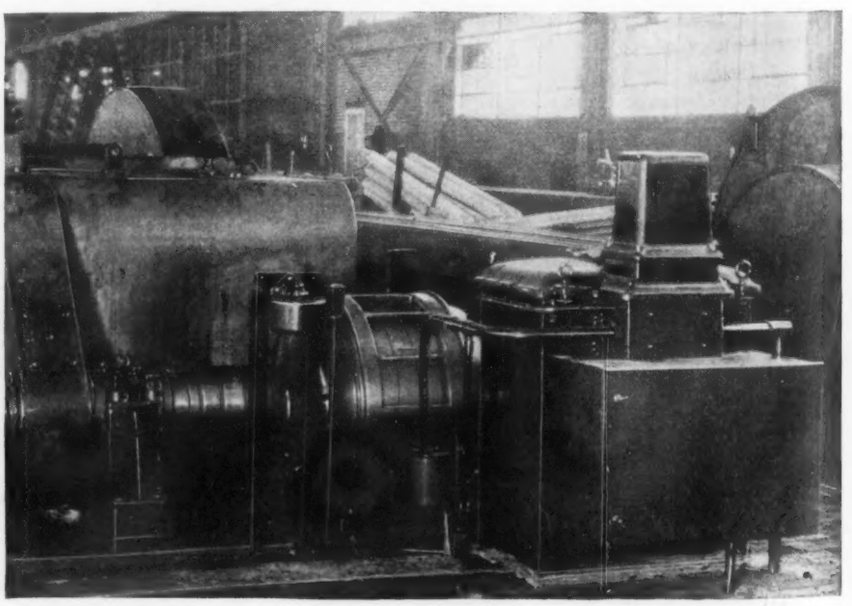
The first situation presented a difficult problem for an economic solution. The existing concrete cells which had wing walls varying from 4 in. to 8 in. could not be used, and even by reducing the size of walls it was apparent that rebuilt concrete cells would require widths sufficient to cause considerable alteration in the high-tension switch room and would involve alteration of the bus structure, disconnecting switch compartments, etc., resulting in practically prohibitive expense. In eliminating the thicker wing walls necessary for concrete cells by the use of steel construction and using this space gained for the new breakers, it was possible to accomplish the replacement with only minor building changes. As shown in the accompanying illustration the unit consists of a large-sized breaker in a framework occupying a small amount of cell space itself and it embodies compact mechanical assembly with the breaker permanently installed and adjusted. Adequate clearances allow proper maintenance and inspection of the unit.

The second situation was equally important for solution. Since the necessary construction work was required to be done while the station was alive and working, the feature of having a breaker unit ready to put into its place and connected in circuit within a few hours' time proved to be a desirable factor and had large bearing upon the ultimate cost of the job. Additional time was saved in that the breaker and mechanism were inspected and adjusted before shipment to the job, and a final test of operation of the unit was made on the floor before it was rolled into its final position.

**Formerly with Byllesby Engineering & Management Corporation.*

Self-Contained Controller Installed in One-Third Usual Time

EXCEPTIONAL and rather unexpected savings in the time required for the installation of a plugging controller on a 200-hp., 2,300-volt motor driving a line of four rubber washers and one cracker were effected by one of the large rubber companies in Akron, Ohio. The controller, which was provided by the Electric Controller & Manufacturing Company, was installed to enable better and safer operation of the mechanical equipment. The rubber company's electrical department, judging from past experience with panel type controllers, estimated that at least a day and a half would be required by four men to install the new controller. However, as this type controller is completely wired and assembled as a single self-contained unit, the installation, including the first application of power to the motor, took less than four and one-half hours.



Plugging controller on 200-hp. motor in rubber mill installed in 4½ hours

Correcting Faulty Operation of Ground Relays

With solid-ground neutral, voltage impressed on relay may be nearly 90 deg. out of phase with fault current. Remedy given

By R. M. Smith
Meter Engineering Department,
Westinghouse Electric & Manufacturing Company

SEVERAL operating companies have recently removed the resistances from the power transformer neutrals and grounded them solidly and, as a result, have found some of their directional ground relays operating incorrectly. The directional element on the relay connected to the faulty section of line held open and the adjoining relay tripped out the wrong section of line. An investigation of the situation has been made, the cause determined and methods perfected for the prevention of faulty operation.

Calculations show that trouble is not likely to occur on systems with resistance in the neutral, even though there is a high ratio of reactance to resistance in the circuit between the generating station and the relays. With ground relays connected to operate on residual current and voltage, in the conventional manner (Fig. 1), the relay operates on the product of the fault current and a voltage equal to the vector sum of the transformer and line drop in the faulty phase between the generating station neutral and the relay plus three times the neutral resistance drop. With the directional element of the ground relay having wattmeter characteristics; that is, maximum torque with the current and voltage in phase, it follows that the impedance of the line up to the relays can be practically all reactance, and the resistance in the neutral can be quite small (since the drop is multiplied by three) without impressing a voltage on the relay greatly out of phase with the fault current. Hence, good closing torque will exist in the directional element. A vector diagram of the relay voltage and current with a ground fault on phase *A* at a power factor angle of 68 deg. is shown in Fig. 2. It may be seen that although the power factor angle of the fault current is 68 deg., the relay operates on a voltage and current only 37 deg. out

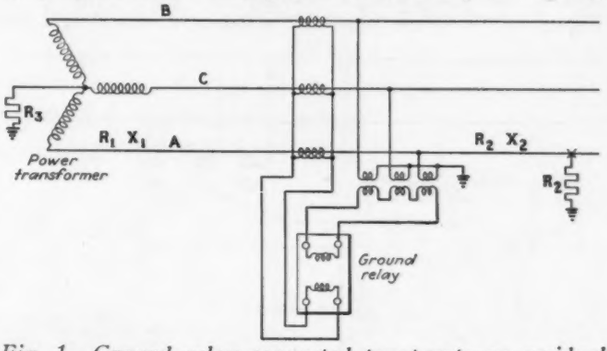
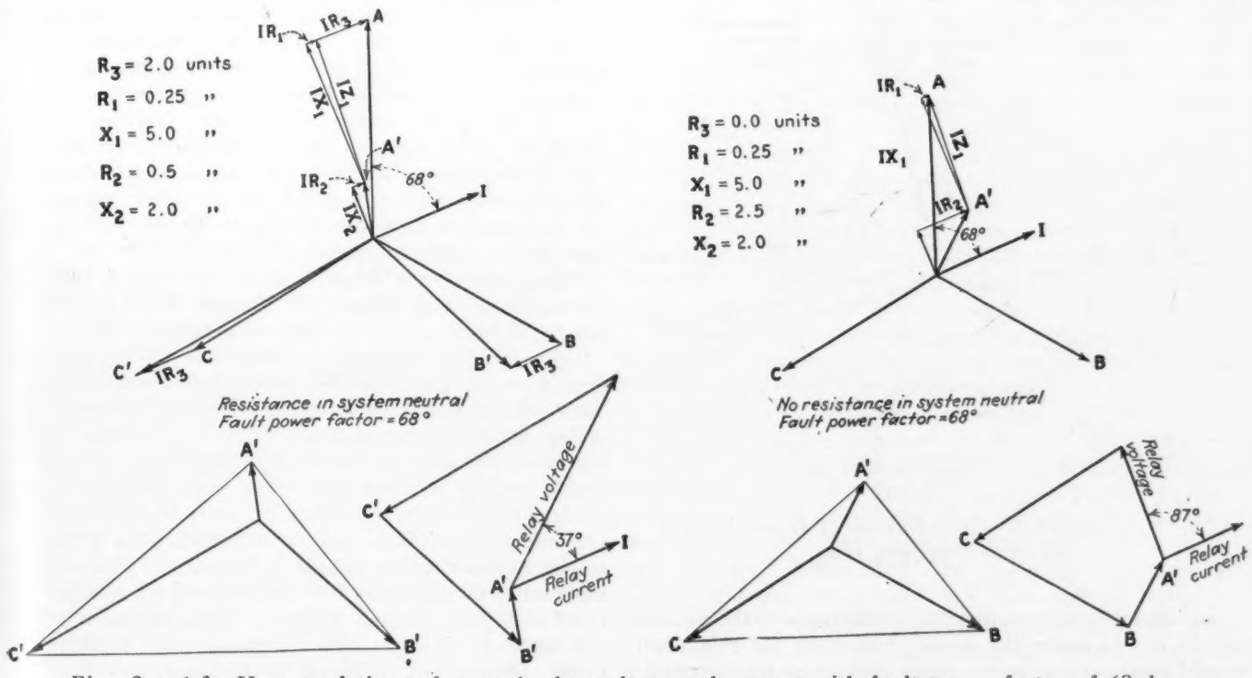


Fig. 1—Ground relay connected to operate on residual current and voltage

of phase, due to the distorted voltage triangle resulting from the neutral resistance drop.

With the neutral grounded solidly, however, faulty operation is likely to occur, since the voltage impressed on the relay becomes only the line and power transformer drop up to the relay, which may be nearly 90 deg. out of phase with the fault current. Small torque will exist in the directional element, even with the increased current which will flow in the fault, because of the removal of the neutral resistance. Due to various causes (such as slight phase angle errors in the instrument transformers, the arrangement of the circuits, or the use of directional elements with phase angle characteristics other than those of a wattmeter) the voltage and current impressed on the relay may exceed 90 deg. in phase position and the directional elements will operate in the wrong direction. Recent experiments on a system showed that



Figs. 2 and 3—Vector relations of ground relay voltage and current with fault power factor of 68 deg.
R_3 is the neutral resistance, R_1 and X_1 the resistance and reactance in the line and transformers up to the relays and R_2 and X_2 the line and fault resistances and reactance from the relays to the point of fault.

a wattmeter inserted in place of a ground relay operated backward, indicating a power flow in the reverse direction when the resistance was removed from the neutral of the power transformer bank.

The vector relations of the residual voltage and current at the relay with a fault on the same phase as in Fig. 2 but with the neutral resistance removed and the

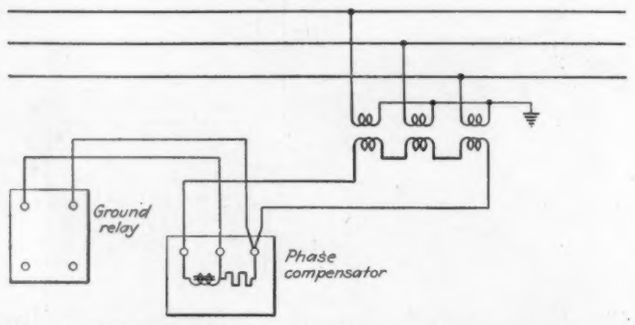


Fig. 4—Phase-angle compensator used when system is to be changed from resistance to dead ground type

fault resistance increased a like amount to make the power factor of the fault again equal to 68 deg. are shown in Fig. 3. It may be seen that the relay must operate on a voltage and current 87 deg. out of phase, and even if instrument transformer errors do not increase this angle beyond 90 deg., the directional element would operate quite sluggishly at the low power factor.

It is interesting to note that with a solidly grounded neutral the power factor of the current and voltage impressed on the relay is independent of the power factor of the fault, but depends only on the ratio of reactance to resistance between the generator and the relay. This means that faulty operation is just as likely to occur with a high resistance as with a low resistance ground fault.

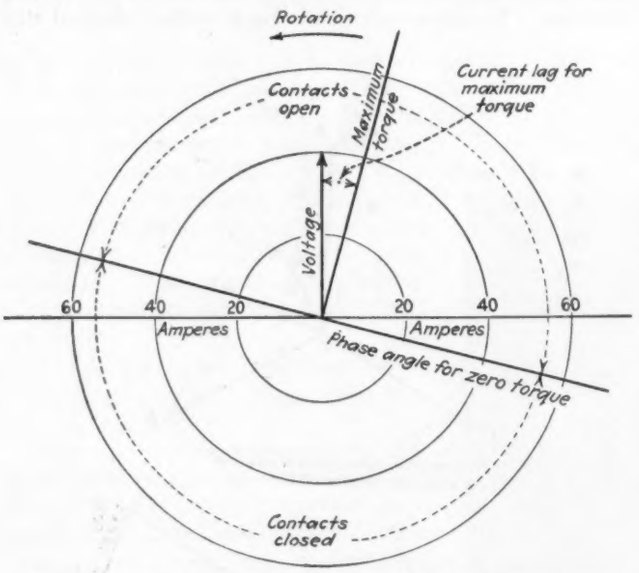


Fig. 5—Phase-angle characteristic of Westinghouse directional ground relay

Incidentally, it is evident that a reactance in the neutral would act to lower the power factor on the relay and would tend to cause more faulty operations than grounding solidly.

Ground relays already installed on a system which is to be dead grounded may be compensated for the low power factor on which they must operate. The device consists of an external reactor and resistor, connected as shown in Fig. 4, and placed in a box similar to those for resistors used with switchboard instruments. This device serves to shift the phase position of the voltage impressed on the relay potential coil in the lagging direction in order that the relay current may lag several degrees past the normal zero torque position without causing the directional contacts to reverse direction and cause faulty operation.

The resistor-reactor combination can be conveniently located on the switchboard panels and only a few changes in the wiring are necessary.

Directional ground relays are now internally compensated so that no incorrect operations on solidly grounded neutral systems can occur due to low power-factor. Instead of having the wattmeter characteristics of most directional elements; that is, maximum torque with current and voltage in phase, the relay is adjusted to produce maximum torque when the current lags the impressed voltage on the potential coil by approximately 15 deg.

Ceramic Firing with Electric Heat

INSTALLATION of a continuous recuperative electric tunnel kiln for firing the colored glazed finish on decorative tile was recently completed at the ceramic plant of the Robertson Art Tile Company, Trenton, N. J. The kiln, which is illustrated on page 876, is of 150 kw. capacity, designed and built by the Electric Furnace Company, and is one of the first applications of electric heat in the ceramic industry. The highly satisfactory results which have been obtained in its operation presage some marked changes in the present time-consuming and rather uncertain methods of glost firing.

The kiln is of the continuous recuperative type, equipped with heating elements of granular carbon in containers of molded carborundum, with which it is possible to obtain temperatures for ceramic processes requiring up to 2,250 deg. F. The complete cycle of preheating, final heating and cooling occupies a period of approximately 21 hours in the electric kiln, accomplishing the same results which require from five to eight days in the ordinary fuel-fired periodic kiln.

Operation of the furnace after the loaded cars are placed in position before the loading doors is entirely automatic both as to time and temperature.

With the electric kiln it is unnecessary to use any saggers, avoiding the expense of their replacement, storage, labor of packing, trucking and loading. Power cost under electric operation has shown a noticeable advantage over the cost of even very cheap fuel. A considerable saving in floor space has been effected by the electric kiln, which replaced four units of the fuel-fired, periodic type. There has, in addition, been a marked saving in labor and reduction in breakage. Probably the most important consideration in favor of the electric kiln is its ability to turn out uniform work, particularly with reference to delicate color shadings and unblemished finish because of accurate temperature control and absence of gases or particles of dust and firebrick settling on the material.

An Interview with M. S. Sloan on

Greater New York Service

Consolidated Gas Company subsidiaries merge executive authority. Unified metropolitan electrical system visioned. Rate reduction presages economies in operation

By L. W. W. Morrow
Managing Editor Electrical World

WITH the election of Matthew S. Sloan, president of the Brooklyn Edison Company, to the presidency of the New York Edison Company, the United Electric Light & Power Company and the New York & Queens Electric Light & Power Company there has been laid on him the task of establishing one electric system under single ownership and management to serve the bulk of the territory of metropolitan New York. Included with these companies are others owned by them or affiliated under the common ownership of the Consolidated Gas Company of New York, so that the electric utilities serving all of New York City, save Staten Island and a small outlying section of Queens County, and also those serving the adjoining county of Westchester—nine in all—are thus to be welded into one large electric service unit.

M. S. Sloan

The problem which lies before Mr. Sloan today is to unify this group of utilities in management, policies and practices. Heretofore they had functioned largely as separate entities in management and operation, although they had been physically interconnected for interchange of energy. It will be Mr. Sloan's task to co-ordinate their service facilities for most efficient and economical use and to establish uniform policies and methods in all the phases of their service to the public.

In 1927 these nine electric utilities supplied upward of four billion kilowatt-hours of energy to nearly two million customers in this metropolitan district. For this energy the customers paid $165,000,000. The companies had an investment of practically $1,000,000,000 in 1,400,000 kw. of generating capacity and the other facilities for supplying electrical service. Taken as a whole, they comprise the largest electrical service organization in the country.

It is apparent that the construction of one service unit in this great and important metropolitan territory presents no small job. In order to give to readers of the Electrical World information of the situation, Mr. Sloan was asked to express his views on what is required.

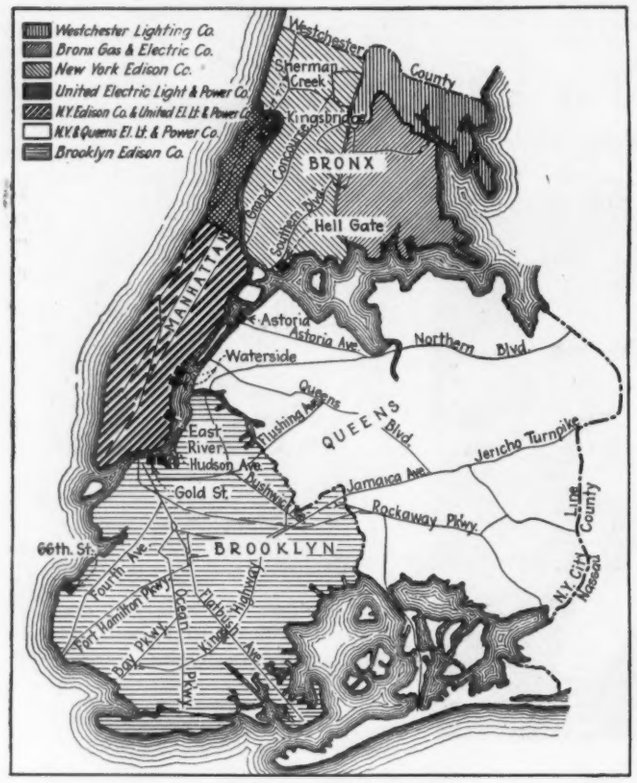
"Even a cursory survey of the New York utility situation shows the possibilities for economies and for service improvement through the unified management and operation of the properties," said Mr. Sloan. "A single electric system in New York is the logical business move to secure savings in operating costs whereby customers' bills will be reduced and stockholders' dividends maintained or increased. We have already eliminated the coal surcharge in anticipation of future savings, and this represents a saving of about $4,500,000 a year to our customers. It is too early to detail all the savings that may be made in finance, engineering, construction and operation, but studies are under way to reap the full advantage of a united system. Load diversity with multiple generating stations will permit of maximum economy in generation, and the benefits of interconnection will be brought to bear on other system costs. All these savings will be sought for the benefit of our customers and of the stockholders of this united system.

"In addition to the maintenance or reduction of present costs, there are many other benefits in a united electric system. A uniform quality of service can be rendered more easily over the entire territory, a uniform customer policy will exist, future territorial developments can be studied and anticipated more readily, and the unit system can act promptly to take advantage of changed conditions in the art or in the business. Unification is too logical a step to be debated and is certain to bring substantial benefits to customers and stockholders."

Electrical men can understand the possibilities of the big picture drawn by Mr. Sloan and realize that the united system is of too recent an origin to permit balance sheets to be made with exact figures. The standards of service are very high in this metropolitan area, and full advantage can be had of all service facilities only with a unified system. The study of future requirements calls for a co-ordination of all plans and a single business entity, if intelligent and prompt action is to be had. Under Consolidated Gas Company control both electric and gas services to New York can go forward as separate units or, should such a future move be warranted, as a single business unit that has for its objectives completely co-ordinated gas and electric service for Greater New York. Wise executive planning has produced the logical utility plan for serving this area.

But the success of any plan depends upon the qual-

ities of the leader selected to put it into operation. In Matthew S. Sloan the New York utilities have a leader who embodies qualities of executive ability and personality that have brought him to the front as an alert and aggressive leader in the electrical industry. He has the experience, the enthusiasm and the ability to shoulder the power and the responsibility that will devolve upon him who develops the New York situation. Mr. Sloan has taken on his new task with characteristic enthusiasm.



Utility service areas and stations in Greater New York

"I like this job," said Mr. Sloan. "I consider it one of the biggest jobs a man could have, but beyond that I believe it to be the most interesting job I could find for myself. Here are more than seven million people dependent on utility service to a degree found in no other area, and it is fascinating to unite the splendid existing organizations and develop a combined property that will give these people the best and most economical electric service our brains and resources can produce. The several companies have done splendid work as separate units and this unification will reap the advantage of their experiences and achievements. Our company needs to be big to do a big job, and I believe we can work out this situation to the great benefit of customers and stockholders and also to the benefit of the metropolitan community we serve."

"Do you believe this job can be done by a single functional unit, or is it too large for a single organization to undertake?" asked the interviewer.

"My personal opinion is that this job should be done by a single utility organization. I am a firm believer in unity and in a single executive responsibility and do not believe any job is too big for an organization to tackle. The advantages of a single organization are so obvious as hardly to be open to debate."

"What policy do you use in building an organization to give electric service?" was another leading question asked Mr. Sloan.

"In the utility business merit must be the only measure for the executive to use in selecting his aids. And merit is measured solely by the effectiveness with which employees work for the benefit of both customers and stockholders. We act as agents of our stockholders and of the customers we serve, and if we bear this fact in mind we can't go far wrong in our actions. This business calls for doing the right thing always, because it is a public business in one sense and because the right thing is always good business in the long run."

This answer of Mr. Sloan gives a key to his character and to his success as a utility executive. He has forged to the front rapidly because he has carried out these policies, because he likes the utility business, and because he is an enthusiastic believer in the need for the service elements in the business.

Mr. Sloan is a dynamic man. He is decisive, direct and energetic and has the faculty of quickly judging values and of giving prompt decisions. He expects hard and intelligent work from his employees but gives them in return responsibility, sympathy, decision and other executive recompenses that develop morale and loyalty in an organization. He is a Southerner and has a great deal of the fire of his native state, and his balanced mind, broad knowledge of his business and fairness make the steel that is tempered by his friendly personality.

At a recent meeting of utility men General G. H. Harries very aptly gave the clew to the human and friendly qualities of Mr. Sloan. He said: "He is four

TABLE I—OPERATING DATA ON MERGED NEW YORK UTILITIES*

	1927	1926
Generator rating, kw.†	1,405,160	1,344,105
Total output, kw.-hr.	3,835,037,362	3,428,048,749
Purchased energy, kw.-hr.	57,800	1,233,680
Number of customers	1,970,090	1,779,013
Average load, kw	437,700	391,329
Gross earnings	$165,589,315	$147,199,492
Net earnings	61,003,564	51,744,180

*Includes the New York Edison Company, United Electric Light & Power Company, Bronx Gas & Electric Company, Brooklyn Edison Company, New York & Queens Electric Light & Power Company, Westchester Lighting Company, Northern Westchester Lighting Company and Peekskill Lighting & Railroad Company.

†Generator rating of Brooklyn Edison Company computed from kva. rating by assumption of 90 per cent power factor.

TABLE II—CAPITALIZATION AND EARNINGS OF MERGED UTILITIES FOR YEAR ENDED DEC. 31, 1927

	Capital Stock		Funded Debt	Earnings	
	Common	Preferred		Gross	Net
Bronx Gas & Electric Co.	(a) 75,000	None	$1,111,000	$2,444,214	$832,227
Brooklyn Edison Company	90,000,000	None	45,451,000	37,198,758	15,344,806
New York & Queens Electric Light & Power Co.	(a) 300,000	(b) 12,500	12,350,000	14,291,269	4,730,516
New York Edison Company	(a) 4,300,000	None	98,076,000	78,588,575	27,270,426
United Electric Light & Power Co.	(a) 866,015	None	(c)...	18,201,167	8,261,367
Yonkers Electric Light & Power Co.	(a) 83,514	.....	.....	.....	.....
Westchester Lighting Co.	(a) 700,000	None	21,825,000	13,284,057	4,175,929
Northern Westchester Lighting Co.	(b) 8,040	None	814,000	1,011,275	230,624
Peekskill Lighting & Railroad Co.	(b) 5,000	(b) 800	646,000	560,000	157,669

(a) Shares having no par value. (b) Shares of par value $100 each. (c) Funded debt in 1926 reported as $30,000,000.

or five President Sloans to some people these days, but to us he is and always will be Matt Sloan." Mr. Sloan likes friends and makes friends and has reached his present position because he unites ability with a friendly personality. He likes young men and is always willing to give them a helping hand. He has climbed the long ladder they are climbing, and he understands them. For young engineers especially he has a liking and a hope, and he frankly tells why:

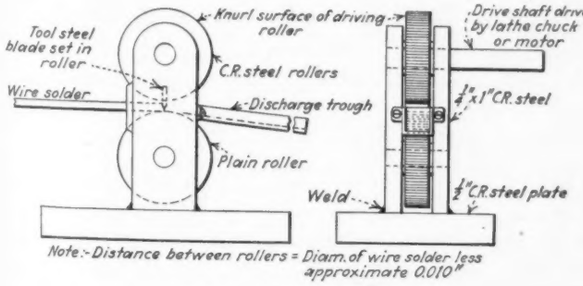
"I was graduated as an electrical engineer, went through 'test' and followed the usual engineering trail for some years. I am glad I had the engineering training and experience and believe that more engineers should set an executive position as their goal in the utility business. The day of guesswork has passed, and if the engineer will develop executive qualities to unite with his knowledge, he will help the industry and help himself. We need engineer-executives in the utility business."

Thus an aggressive, experienced and able leader is now directing the destinies of New York's electric utilities. The situation he faces is great in size and has equally great possibilities of accomplishment. The stage is set, the play is written, and the electrical industry wishes Mr. Sloan and his associates success as the footlights are turned on.

Precut Solder for Terminals

By Fred Habel
Detroit Edison Company, Detroit, Mich.

IN THE wiring of switchboards and other equipment in which a large number of lug terminals are used it has been found that the work can be done more speedily and neatly and an appreciable amount of solder can be saved by the use of pieces of wire solder cut in lengths to just fill the cup of the lug when the conductor is inserted. To cut the solder to these determined lengths the Detroit Edison Company has in its shop a small machine along the general line of the sketch reproduced here. The device resembles a toy clothes wringer, except


Knurl surface of driving roller
Drive shaft driven by lathe chuck or motor
Tool steel blade set in roller
C.R. steel rollers
Wire solder
Discharge trough
¼" x 1" C.R. steel
Plain roller
Weld
½" C.R. steel plate
Note:- Distance between rollers = Diam. of wire solder less approximate 0.010"

Solder-cutting machine

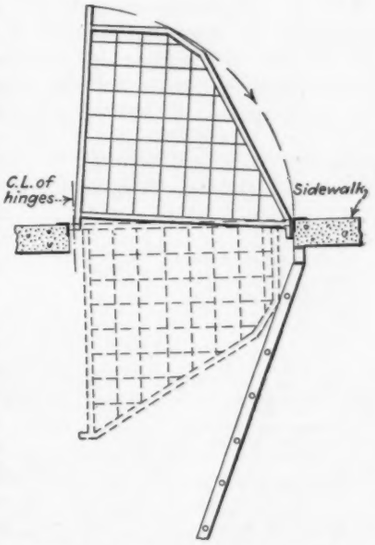
that the rolls are of metal; the lower one is smooth and the upper roll is knurled to prevent slipping and carries a tool steel cutter that cuts off the solder as the two revolve. Supporting end frames, arranged to be set in a lathe bed; a drive shaft extending from the top roll which is chucked in the lathe or motor-driven, and a take-off trough complete the machine. The rolls are set up together so that the wire solder is pulled into them as they revolve, and the cutter slices off lengths equal to the circumference of the upper roll. Different lengths may be cut by using rolls of different diameters. With the lathe turning at reasonably high speed, this machine will cut enough solder in a couple of hours to keep a crew of copper benders busy for several months.

Sidewalk Safety Guard Reduces Pedestrian Hazard

A SIDEWALK safety guard which is an integral part of the vault cover and which reduces pedestrian hazard to a minimum is being used by the United Electric Light & Power Company, New York. The guard

Sidewalk safety gate in open position
The gate is held in the open position by the straps as shown

when raised forms a complete protection both to the workman and the pedestrian as it is completely inclosed. In the illustration a workman is seen emerging from the vault through the gate of the guard. The gate is self-closing to avoid it being left open by the workman. The side elevation shows the safety guard in the open as well as closed positions and it can readily be seen how simply it operates. With the old type of guard it was necessary for the workman to pull it up in place after the cover was removed, but frequently this safety precaution was neglected. With this safety guard opening the cover automatically puts the guard in place, which with the self-closing gate makes a foolproof device.



Side elevation of safety guard showing open and closed positions

Load Characteristics of Neon Signs

A SURVEY of the 600 neon signs installed and serviced in the territory of the Detroit Edison Company was reported upon at the recent annual convention of the Illuminating Engineering Society by H. A. Cook. As a result of the investigation of power factor, wattage consumption and general performance it was concluded that: (1) Neon signs are good revenue producers. The long burning hours make this a very desirable load. (2) Their power factor is not of the highest order, but inasmuch as the signs are normally used in connection with a large incandescent lamp load, the power factor of the entire installation is so high that consideration of the power facter of the sign itself is comparatively unimportant. (3) Where maintenance contracts are included in the purchase of signs, no trouble should be experienced due to outages, etc., these being taken care of by the sign company and not the consumer. (4) A general stimulation of the sign business has resulted since the introduction of this new advertising medium. Incandescent lamp signs are being used for longer hours and merchants are becoming more conscious of the value of electrical advertising.

CONSOLIDATED DATA FOR 42 REPRESENTATIVE NEON SIGNS

Tubing Diameter	Average Power Factor	Average A.C., Watts per Foot	Average D.C., Watts per Foot
12 mm.	0.410	8.37	21.20
15 mm.	0.476	6.06	11.63

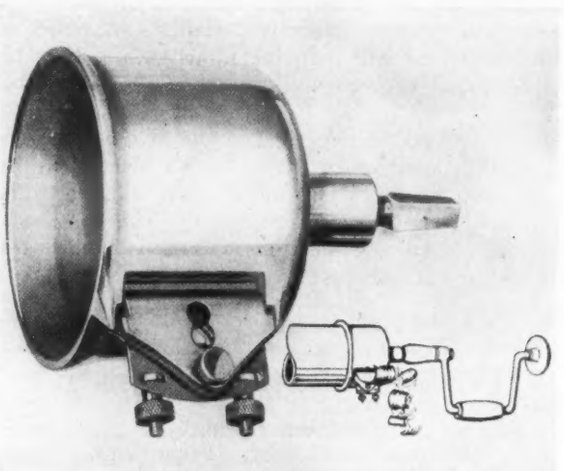
Burning time averaged 13.9 hours per day.

Fault Locations in Street Lighting

THE analysis of fault locations in series street lighting systems presented here is compiled from data presented by the Department of Gas and Electricity of the city of Chicago, in its annual report for 1927. From these figures it appears that cable is responsible for most trouble, it having a trouble percentage rating about 2½ times its nearest competitors, lamp film cutouts and posts or poles. This is not a new discovery in street lighting performance. The second table is appended merely to present an idea of the size of the system on which the fault location analysis is based.

Doing a Week's Work in One Day

BY THE use of the conduit-tapering tool illustrated herewith the Fall River Electric Light Company shapes the ends of fiber conduit seven times as fast as can be accomplished with a draw knife. One man suffices. In addition to the labor-saving feature a tighter and smoother joint is obtained. The tool operates after the manner of a pencil sharpener with an adjustable blade and the shank fits any ordinary brace. With this tool, which is made by the Line Material Company, Milwaukee, Wis., short pieces of fiber pipe may be tapered and used that would not be worth using under hand tapering.



Conduit tapering tool saved time at Fall River

Table I—Numbers and Locations of Faults in Chicago Series Street Lighting Systems in 1927

Location of Fault	600 Cp. System No.	600 Cp. System Per Cent	400 Cp. System No.	400 Cp. System Per Cent	250 Cp. System No.	250 Cp. System Per Cent	100 Cp. System No.	100 Cp. System Per Cent	Total Faults No.	Total Faults Per Cent
1. Regulator	30	1.82	2	5.26	20	1.66	41	2.51	93	2.05
2. Station	16	0.97	..	.....	20	1.66	16	0.98	52	1.15
3. Cable	296	17.94	20	52.62	615	51.1	437	26.7	1,368	30.2
4. Transformers	47	2.85	2	5.26	84	6.98	84	5.13	217	4.79
5. Wire	288	17.45	..	.....	2	0.17	1	0.06	291	6.43
6. Pole or post	29	1.76	1	2.63	57	4.74	488	29.82	575	12.69
7. Automatic hanger	33	2.0	..	.....	.....	.....	.....	.....	33	0.73
8. Fixed hanger	82	4.96	..	.....	.....	.....	.....	.....	82	1.81
9. Lamp drops	212	12.85	..	.....	.....	.....	.....	.....	212	4.68
10. Binding post	349	21.15	..	.....	.....	.....	.....	.....	349	7.71
11. Compensator	111	6.73	..	.....	.....	.....	.....	.....	111	2.45
12. Lamp film cutout	.....	.....	13	34.24	299	24.9	283	17.3	595	12.9
13. Transformer film cutout	.....	.....	..	.....	2	0.17	2	0.12	4	0.08
14. Socket	.....	.....	..	.....	15	1.25	183	11.19	198	4.38
15. Globe off	.....	.....	..	.....	1	0.08	11	0.67	12	0.27
16. Outside cause	107	6.48	..	.....	62	5.16	52	3.18	221	4.88
17. Unknown cause	37	2.24	..	.....	20	1.66	20	1.22	77	1.7
18. Boulevard stop-light	13	0.79	..	.....	6	0.5	19	1.16	38	0.84
Totals	1,650	100.0	38	100.0	1,203	100.0	1,637	100.0	4,528	100.0

Table II—Numbers of Lamps in Chicago Series Street Lighting Systems

Service	600 Cp. 1926	600 Cp. 1927	400 Cp. 1926	400 Cp. 1927	250 Cp. 1926	250 Cp. 1927	100 Cp. 1926	100 Cp. 1927	Totals 1926	Totals 1927
Overhead	23,513	23,083	169	183	.....	.....	.....	.....	23,682	23,266
Underground	3,809	3,700	...	754	14,578	20,377	28,581	27,919	46,968	52,750
All	27,322	26,783	169	937	14,578	20,377	28,581	27,919	70 650	76,016

Business as Usual

An Interview with

JOHN J. O'BRIEN
President H. M. Byllesby & Company

John J. O'Brien

THERE is a generally accepted idea to the effect that business is always bad in a presidential year. As the case is usually stated, this poor condition of business is due to uncertainty as to who will be elected, with consequent uncertainty as to the policies the new administration will follow. In an effort to ascertain what the electric public utility industry thinks of business conditions during the current presidential campaign, ELECTRICAL WORLD asked John J. O'Brien, president of H. M. Byllesby & Company, for his opinion on the subject. Mr. O'Brien said:

"For an answer to that question I will refer you to the files of the *Byllesby News Bulletin*, issued weekly, and ask you merely to glance over some of the headlines of news stories regarding our properties. Take these, for instance:

" 'First 16,000-Kw. Unit at Prospect No. 2 Placed in Operation.' That's the California Oregon Power Company. 'Construction Progress on San Diego Company Plant Extension.' 'Oklahoma Gas & Electric Beats Schedule in Rush Oil Field Contract.' 'New Duquesne Light Substation and Line Placed in Service.' 'Oklahoma Gas & Electric Buys 13,000-Kw. Generating Station.' 'Pittsburgh Heating Station Construction Started.' 'Chippewa Falls Hydro Completed Ahead of Schedule.' 'New Business Survey Shows Large Gain by Oklahoma Gas & Electric.' 'Mountain States to Install New Generating Unit.' 'Use of Electricity Increasing in Oil Fields.' 'Louisville Gas & Electric Stockholders Vote on Increase of Capitalization.' 'New Northern States Turbine at St. Paul.' 'New Towns Added to Oklahoma Gas & Electric System.' 'Rate Reductions Announced by California Oregon Company.' 'Duquesne Light Company to Have New 60,000-Kw. Power Station.' 'Mountain States Company Starts New 70-Mile Line.' '30,000-Kw. Unit at Harrah Placed in Service.' 'Northern States Announces Rate Reduction.' 'Mountain States Company Installs New Hydro Unit.'

"These stories refer to work completed and in progress in a number of sections of the United States. I have read only part of them; there are a great many more, all telling the same story of building power plants, substations and lines, reducing rates and acquiring new business, bringing isolated utilities into interconnected systems, making electricity available in greater quantities and at lower rates to those who already have it, and bringing it to farms and communities that have never before enjoyed its advantages. Last year our expenditures for new construction totaled $48,870,800; this year our budget calls for the investment of $53,735,000. This activity is going on in a presidential year. Some of it was started before the year opened, and a lot of it will be continued after the year is closed. This year is no different from any other. The electric utilities must build; they must grow; they must develop; they cannot afford to slow down, simply because this is a presidential year. If the utilities curtailed their program of expansion for such a reason, they would be failing in their duty to the public they serve and to their stockholders and investors. The electric utility business is a long-time business. It rests on the same foundations that support the whole economic and social structure of the country. It grows with that structure because it is an integral part of it.

"I think I am safe in saying that the Byllesby organization is typical of the industry as a whole in its attitude toward business development. Figures on construction are interesting only as they reflect necessary growth to meet the continually increasing demands for service. Of the more than 26,000 individuals in the Byllesby organization, at least 1,000 are engaged in new business and commercial development. They are working not merely to sell the public more electricity and gas, but to show the public how electric service may be made useful and productive in industry, in the home and on the farm. Intensive and intelligent sales and advertising efforts are bringing the advantages of complete electric service to the public. Industrial power applications are increasing; sales of domestic labor-saving appliances throughout the territories we serve are better than ever before. This means that electricity sales are increasing, but, what is more important, it shows that the public is getting more and more real benefit from its use of electric service.

PROGRESS IN RURAL ELECTRIFICATION

"Take the subject of rural electrification, for instance. Every one knows that there is a difficult problem involved in supplying electricity to scattered farms and farm homes, and the utilities in general have approached the problem intelligently and scientifically. They have not rushed into doubtful extensions, but have felt their way carefully, experimenting and keeping careful records of results, until today it is almost certain that electrification of farms can be carried on successfully with greatly beneficial results to the farmers and satisfactory financial returns to the companies.

"A study by the University of Minnesota of results of rural electrification of five farms on the Red Wing, Minnesota, experimental line of the Northern States Power Company shows that the farmers actually have received great pecuniary benefits. During the four-year period of electrification covered by the report, it is shown

that the combined gross revenues of five farms increased 42.9 per cent, while net income increased 81 per cent. These farmers, during 1927, each used an average of 243 kw.-hr. a month; their average monthly service bill for that year was $14.77. Imagine a farmer a few years ago being willing to pay nearly $200 a year for electric service. These men are glad to do it today because they know that electricity has proved its value to them. This is real 'farm relief.'

"In my opinion the electric utilities will continue to go forward year after year, through presidential elections as well as ordinary periods, increasing their usefulness to the public, expanding, growing, building for a greater industry and a greater and more productive nation."

Dry Cell Battery Used for Tripping High-Tension Oil Circuit Breakers

USE of dry cell batteries for tripping high-tension, 7,800-volt and 13,200-volt oil circuit breakers at customer installations where no direct-current source is available has been used by the United Electric Light & Power Company, New York, since 1926 with very satisfactory results. The average life of a dry cell battery operation is ten months. Prior to that time the breakers were tripped by means of a two-coil direct-trip alternating-current attachment. This attachment was operated from the same current transformers that operated the relays. At each installation there already was a battery of 24 dry cells connected twelve in series and two groups in parallel having an open circuit voltage of approximately 18.5 volts for furnishing the direct current needed for the metering equipment.

The primary and secondary holding coils of a direct-trip attachment were removed and tests were made on the trip coils. The direct-current resistance of each coil was approximately 0.35 ohms. The two trip coils were connected in series and then connected to the dry cell batteries (two sets of twelve series connected cells in parallel). The trip coils were energized for two seconds each minute for 7½ hours each day until 3,182 operations had occurred, at which time the test was discontinued. The amperage and voltage of the battery before and after the test were as shown in the table above. The minimum operating amperage and voltage of the two trip coils in series were 4.5 and 3.5 respectively.

Volts			
Open Circuit	Closed Circuit	Amperes	
18.5	12	28	Start
14	4.5	9.9	3,182 operations

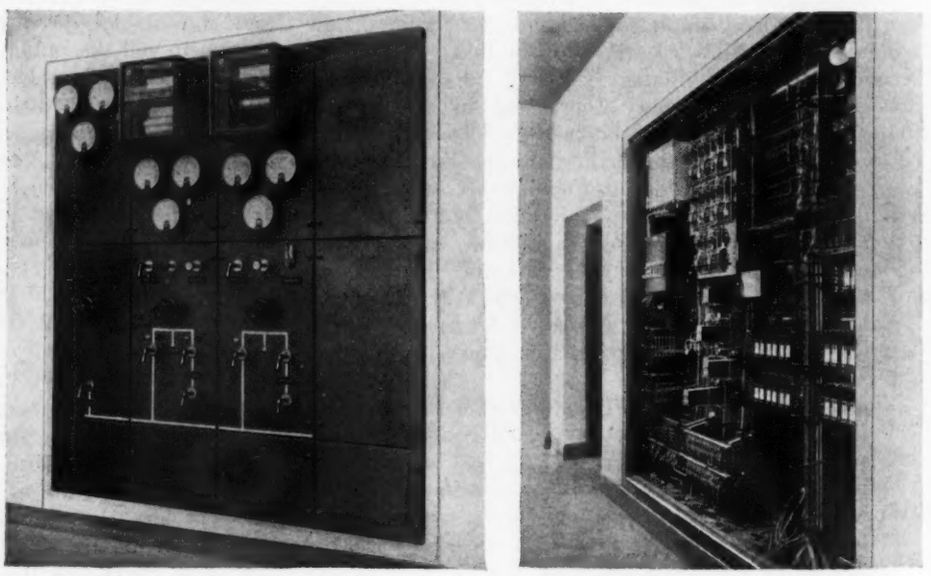
The above test proved that dry cells could be used for the tripping supply with satisfactory results. In addition to the fact that dry cells were then being used at each installation for another purpose, dry cells are more desirable than storage batteries owing to the lower initial cost and also the fact that they require no maintenance.

The problem of checking the battery has proved to be very simple. A polarized receptacle is mounted on the front of each switch for testing the battery, the battery test being made every two weeks by the meter man, who has to read the demand printometer every two weeks. A special voltmeter was made for testing the battery. This meter has a 1-ohm and a 6-ohm resistor mounted in the case, the 6-ohm resistor simulating the load of the metering equipment and the 1-ohm resistor simulating the load of the trip coil. There are two push buttons on the meter providing for readings of circuit voltage, the voltage across the 1-ohm resistor and the voltage across the 6-ohm resistor. When the voltage across the 1-ohm resistor is less than 11 volts the battery is replaced. The battery test is made under normal operating conditions. The polarized receptacle eliminates the possibility of the tester connecting the voltmeter across the wrong studs on the test panel and thus tripping the breaker.

Wall-Mounted Switchboards Conserve Space

A NEAT-APPEARING and satisfactory method of mounting switchboards for auxiliary apparatus is that used by the Southern California Edison Company in the operating room of its new Long Beach No. 3 steam plant. As shown in the accompanying illustrations, the boards are set in the wall with the front flush with the inner wall of the operating room.

This method of mounting not only conserves space in the operating room but offers easy access to the rear of the boards. It also provides a less expensive means of installing conduits for control wires, since the conduits may be placed in the wall instead of in the floor, thus eliminating bends. This type of installation can of course be used only where there is a room or hallway adjacent to the operating room.

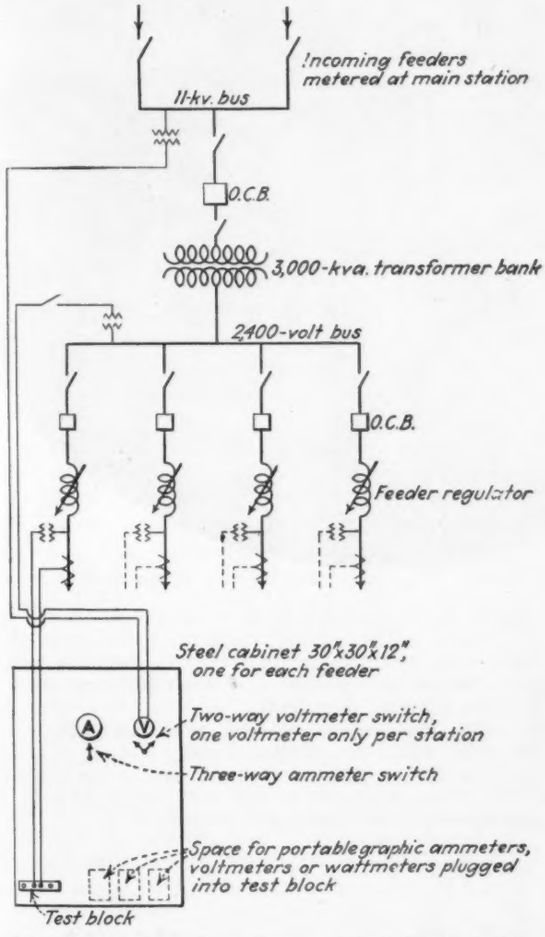


Front and rear views of auxiliary apparatus switchboards mounted in wall of operating room to conserve space and improve appearance of the room

Reduces Metering in Unattended Substations

By E. F. Pearson
Electrical Engineer Northwestern Electric Company, Portland, Ore.

CONSIDERABLE saving in fixed charges and operating costs has been effected by the Northwestern Electric Company through the elimination of practically all meters in unattended substations. These substations consist mainly of 3,000-kva., 1,000-kva. and 600-kva.


Incoming feeders metered at main station
11-kv. bus
O.C.B.
3,000-kva. transformer bank
2400-volt bus
O.C.B.
Feeder regulator
Steel cabinet 30"x30"x12", one for each feeder
Two-way voltmeter switch, one voltmeter only per station
Three-way ammeter switch
Space for portable graphic ammeters, voltmeters or wattmeters plugged into test block
Test block

Metering connections for unattended substations

But one voltmeter per station and one ammeter per feeder are required. Steel cabinets are provided for installation of portable graphic meters.

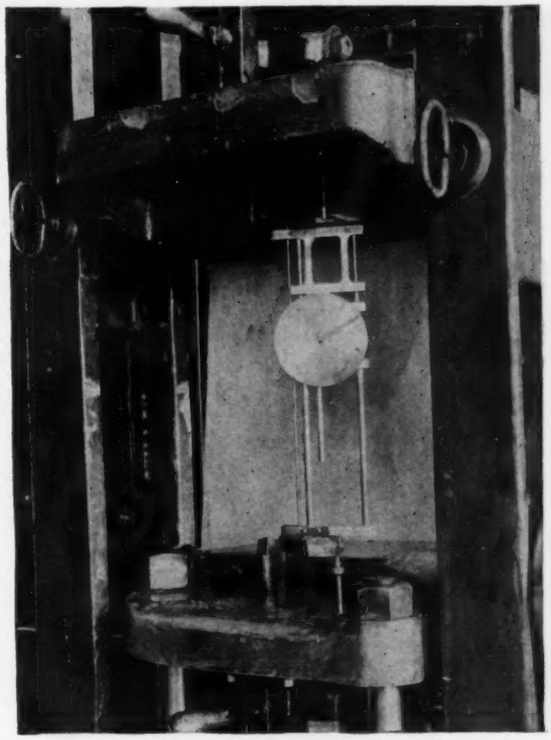
units stepping down from 11,000 to 2,400 volts for city distribution. Some are full automatic and some partially automatic with regulated feeders, ranging from one to four per station.

The total metering equipment per substation consists of one indicating voltmeter to furnish bus voltages and one indicating ammeter per feeder with three-way switch. Potential and current transformers are installed on each feeder and leads terminate in a handy test block mounted on a panel in a sheet-metal meter box. Room is provided in this box for portable graphic ammeters, voltmeters and wattmeters. Three portable graphic ammeters are set on each feeder one day per month and their charts provide sufficient information for load dispatchers and for system study purposes. Distribution efficiencies and losses are obtained from readings on watt-hour meters on the 11,000-volt supply lines out of main substations.

The portable meter system has been found to have the following advantages: Saving in fixed charges on meter investment, one set of graphic ammeters, voltmeters and wattmeter will provide one daily chart of each type per month for each of 25 feeders, saving meter reading, meter charts and office record expenses.

Time Saved by Calibrated Extensometer on Wire Tests

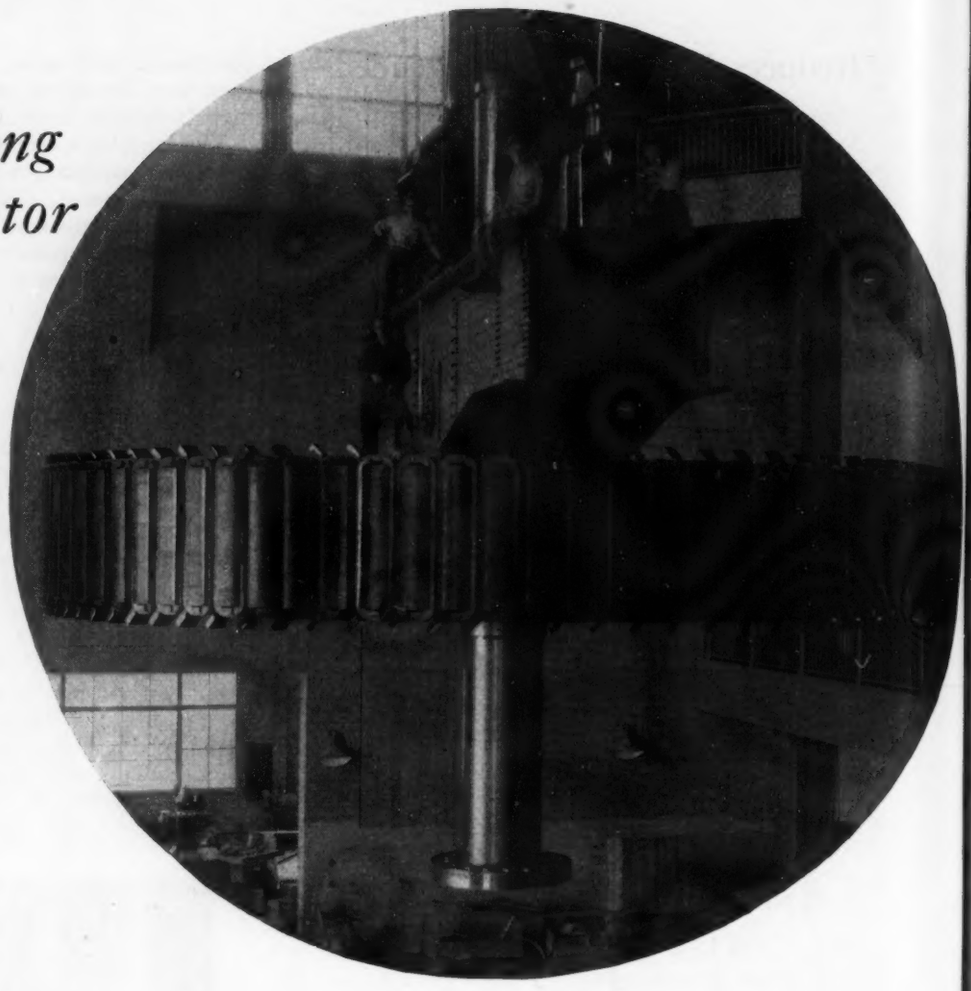
AN EXTENSOMETER scaled to read per cent elongation directly is used by the West Penn Power Company for running commercial tests on the elongation of solid wire. The extensometer consists chiefly of two parts—the lower clamp with two rigid vertical guides and the upper movable part, which is also a clamp and which moves on the guides. The two clamps are attached to a specimen of wire in the testing machine in such a manner that the clamps are 15 in. apart, and as the wire elongates the two clamps separate. To measure the elongation a dial is attached to the lower clamp section and a rack is attached to the upper clamp section. This rack engages a hand on the dial, which is calibrated by test to read percentage elongation directly. This extensometer may be clamped on the wire while it



Direct-reading extensometer saves time in routine wire tests

is being tested and the elongation may be obtained at the time of rupture or at any point of stress on the wire. It avoids computation errors and saves considerable time. The machine was designed and built by D. K. McIlvaine, meter superintendent West Penn Power Company.

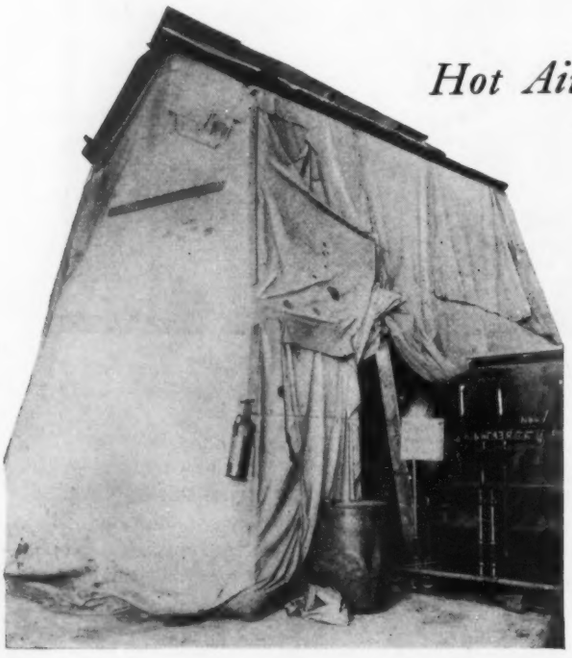
Accurate Setting of 258-Ton Rotor Assured



AT THE Conowingo station of the Susquehanna Power Company Stone & Webster, Inc., built a 42-ton structural steel carrier to facilitate placing the 258-ton rotors of the several 40,000-kva. generating units within their respective stators. The carrier was used in connection with two 150-ton electric cranes and was built to allow for universal movement of the rotor shaft and assembled coils when setting the mass accurately in place inside an air gap of less than 1 in., and adjusting the rotor coupling bolt holes to match those of the turbine coupling. It was built of plates and angles, the two main girders being 30 ft. 4½ in. long over all and 5 ft. 10 in. in maximum height. The crane hooks were 26 ft. apart on centers.

Each crane was provided with a twin hook, from which bronze bushed links pin-keyed to a cheek plate depended. The cheek plate terminated in a trunnion bearing with keyed pin, provision being made for high-pressure grease lubrication. The ends of the trunnion were supported in bearings held by castings within the girder structure, all castings being of electric steel to insure uniform quality. The load of the rotor and shaft was carried by a special design of interior head equipped with split key rings, collar, roller bearings and casting connections to the main frame of the lifting device. The rotor shaft was grooved ¾ in. deep and ¾ in. wide and the rollers were 2 in. in diameter, the roller bearing in the head being 2 ft. 8¼ in. in diameter inside and 3⅛ in. outside. The outside diameter of the rotor shaft was 30 in. An indicating pointer was provided with central target to enable the equalization of the rotor to be checked at all times from the floor level.

By using this equipment and procedure adjustment of the rotor could be effected by the use of six men as follows: One in each crane cab, one at the coupling (an extra man can be used here if convenient), two on the air gap diameters and one rigger foreman.



Hot Air Generator-Drying Saves Week's Time

USUAL practice in drying out newly installed generators is to run them on short circuit after the prime mover is ready for operation. Often, however, the generator is ready for drying a short time in advance of the completion of the steam or hydraulic unit, and if the generator could be dried out and ready for operation at the time the prime mover is ready a valuable saving in operating time could be effected.

In the case of the two 45,000-kva. generators at the Big Creek No. 2-A plant of the Southern California Edison Company a week to ten days time was saved by drying the generators out with warm air before the water wheels were ready for service. A wood frame was erected over the generators and a metal roof and canvas covering provided as shown in the accompanying illustration. Electric hot blast dryers of 25 kw. capacity were then placed, feeding into the inclosure to provide the drying.

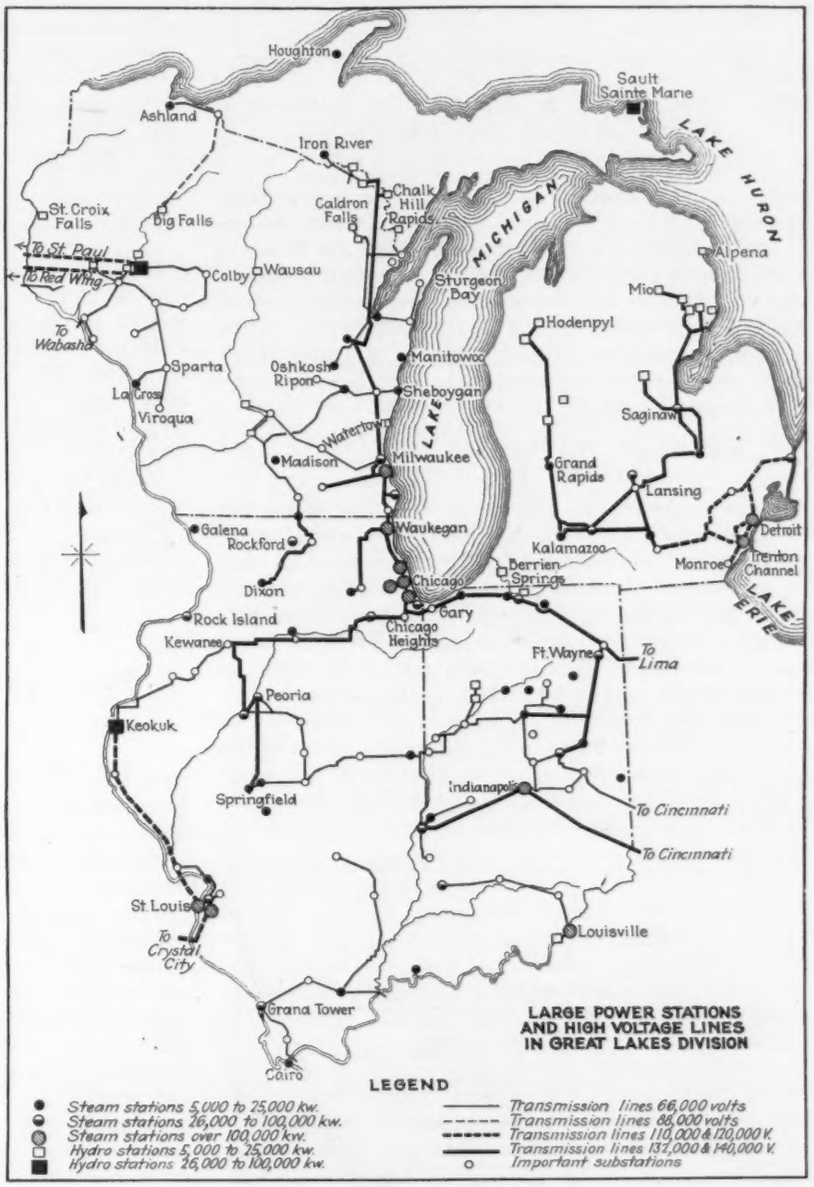
Great Lakes Power Survey

Large increases in station capacity and transmission line mileage indicate progress in three years since original survey. Rural electric service growing rapidly

THE recently issued 1928 supplement to the power survey covering the states of Illinois, Michigan, Indiana and Wisconsin indicates large progress in electricity supply and utilization in the three years that have elapsed since the original survey was made. The survey and the present supplement to it were made by the committee formed for that purpose in the Great Lakes Division of the National Electric Light Association.

Additions to electric generating capacity in the four states to Jan. 1, 1928, amounted to 1,300,000 kw., making a total of 4,556,000 kw., of which somewhat more than 10 per cent is in hydro-electric stations. This total is an increase of 40 per cent in three years. Accompanying this growth was an increase in area served and improvement in the service. Transmission lines have been extended into regions hitherto unserved or only partly served. The map here reproduced shows at a glance how widespread electric service now is in this district.

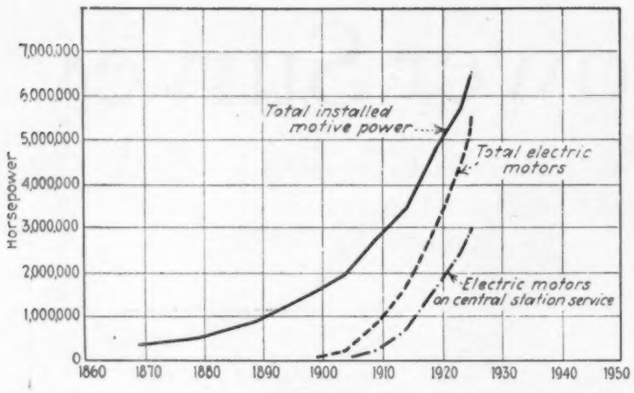
The 1,300,000-kw. increase in generating capacity was almost entirely in existing stations. One new station of "superpower" class is being erected at Powerton, on the Illinois River just below Pekin. Its first unit of 55,000 kw. was placed in operation late this summer, thus making available to the Illinois Valley region and to central Illinois the advantages of another modern large capacity station. A second unit of equal capacity has been ordered for operation next year.



Transmission lines of 66 kv. or more and power stations of 5,000 kw. or more in Great Lakes Division

Transmission Lines

In the field of transmission large additions have been made. Most of these additions were lines of 66 kv. and under, but some important accretions to higher voltage transmission are to be noted. Among these are the 132-kv. cable installation in Chicago, the tie between the Detroit Edison and Consumers Power systems in Michigan, and in Wisconsin the line from the Chalk Hill plant on the Menominee River. A 132-kv. line, which will complete an outer belt line around Chicago from Waukegan to Joliet, Gary and Michigan City, is now under construction between the two first-named cities. Two important new lines at 132,000 volts are now under construction in Indiana. One of these extends from Indianapolis to the vicinity of Cincinnati, Ohio. It will complete a line of this high voltage all the way across the state, from the Dresser station near Terre Haute to the Columbia station in Ohio. An older line of this voltage spans the northern part of the state—from Chicago to South Bend, Fort Wayne, and on, passing through



Motive power installed in manufacturing industries in states of Great Lakes Division

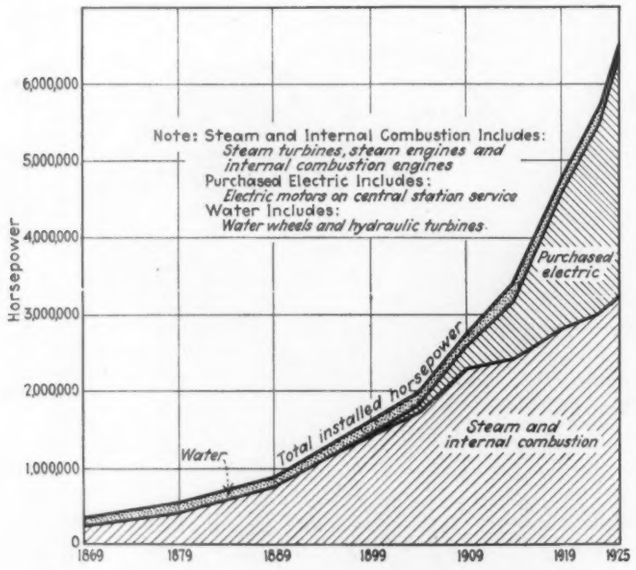
Lima, Ohio. A branch from the latter line is now being extended from Fort Wayne to Marion, Muncie, Anderson and Kokomo. At each of these places the line will be tied in with large systems serving important areas.

Approximations of transmission line mileage as of Jan. 1, 1928, obtained by scaling transmission line maps are shown in the accompanying table. The actual circuit mileage is, of course, greater than these figures show. No distribution lines are included in this table.

$200,000,000 for Midwest Farm Lines in Next Ten Years

In many agricultural districts in the four states the electricity-supply industry has been developing rural service in an efficient and energetic manner. Joint organizations of farmers, power companies, agricultural colleges and equipment manufacturers have been conducting experiments on the electrification of farms in all states of the Great Lakes Division. A survey made by the rural electric service committee of the National Electric Light Association during the year 1923 showed that there were 15,854 farmers living in the four states of the division who were then receiving electric service from central-station lines. A similar survey made during the year 1926 showed that these had increased to 30,160, or nearly double the number in three years. If this same rate of increase continues, more than 120,000 farmers will be receiving service in this area by 1932, and by 1938 the number will have reached approximately half a million. This is equal to about half of the total farms in the Great Lakes Division, and the cost of the necessary distribution lines alone will then be approximately $200,000,000.

While no surveys have been made for the year 1927 to determine the actual number of farms connected during the year the best information available indicated that 10,000 new farm customers were added. The high rate of increase is apparently being maintained.



Horsepower of electric motors compared with total power in Great Lakes Division industries

TABLE I—INSTALLED CAPACITY OF PUBLIC UTILITY POWER PLANTS IN GREAT LAKES DIVISION

From U. S. Geological Survey—All Capacities in Kilowatts

Year	Illinois	Indiana	Michigan	Wisconsin	Great Lakes Division	United States
1920.....	805,545	319,174	551,985	349,067	2,025,771	13,093,972
1921.....	909,725	358,976	550,522	350,643	2,169,866	14,399,052
1922.....	961,592	365,670	545,785	358,251	2,231,298	15,482,526
1923.....	1,008,126	394,939	598,328	425,217	2,426,610	15,970,787
1924.....	1,170,182	446,641	604,058	444,704	2,665,585	17,369,127
1925.....	1,417,722	503,395	737,314	499,864	3,158,295	19,519,000
1926.....	1,674,889	660,665	955,555	576,565	3,867,674	23,618,762
1927.....	1,803,538	674,719	1,067,584	636,367	4,182,208	25,398,385
1928.....	2,046,180	652,101	1,223,298	633,960	4,555,539	27,690,891

TABLE II—TRANSMISSION LINES IN GREAT LAKES DIVISION

	Miles
Illinois	7,667
Indiana	6,045
Michigan	5,228
Wisconsin	6,150
Total Great Lakes Division	25,091

Mounting Oil Switches on Concrete Flooring

By John S. Isdale

IN A new substation a number of oil switches and a low-tension switchboard were to be erected in a line across the building. To avoid drilling separate holes in the concrete floor, which does not lend itself to accuracy (as the resulting holes are often too large for lag shields, tending toward badly fitting bolts and loose connections during operation) the procedure shown in the following was adopted:

Iron bars 0.5 in. thick and 4 in. wide were laid on plate washers about 1 in. thick and 4 in. long, spaced at intervals. The assembly having been lagged to the floor and leveled up, the oil switches and switchboard supports were located on the bars and holes accurately spotted and drilled for bolts. By this method all the equipment was lined up and securely bolted in position, the holes being drilled quickly and with less chance for wandering, while the spacers provided room for inserting the nuts and tightening with a wrench. Bolts can be inspected and periodically tightened and after several years' hard service the oil switches and board supports are as rigid as when installed.

A final refinement might have been to set up boards or strips along the bars and grout with cement, but this does not seem to have been necessary, as any dirt or dust that gets under the bars can be easily removed by a brush or vacuum cleaner.

Line Erection Cost Accounting

Simplified cost finding system for line erection makes possible a weekly analysis showing the status of work in progress

By F. W. Fackler

Assistant Treasurer Hoosier Engineering Company, Chicago, Ill.

COST finding as a vital factor in successful and economical transmission line erection is now generally recognized. There are many and widely divergent views as to how far cost keeping should be carried. The tendency in many cases seems to be toward elaborate and intricate systems, which, as a rule, involve unnecessary detail and expense. To be of the greatest value a cost system for line erection should be so simple that it will be possible for all foremen to understand in a general way its function and operation.

It is well to keep in mind at all times that besides being an accounting record it is an excellent aid to the heads of the engineering and construction departments properly to administrate their departments. The information contained in the cost records is also of considerable value to the estimator. These men, as a rule, have only a limited knowledge of accounting; therefore, the records kept and the reports made therefrom should be such that others than expert accountants can understand them. The advantages of less technical records are obvious, but often do not seem to be taken into consideration.

Reports rendered should be concise and clearly set out the facts. Reports which are involved and unnecessarily extended seldom fully accomplish their mission due to the fact that reading them is a tedious, disagreeable job instead of an interesting and instructive task.

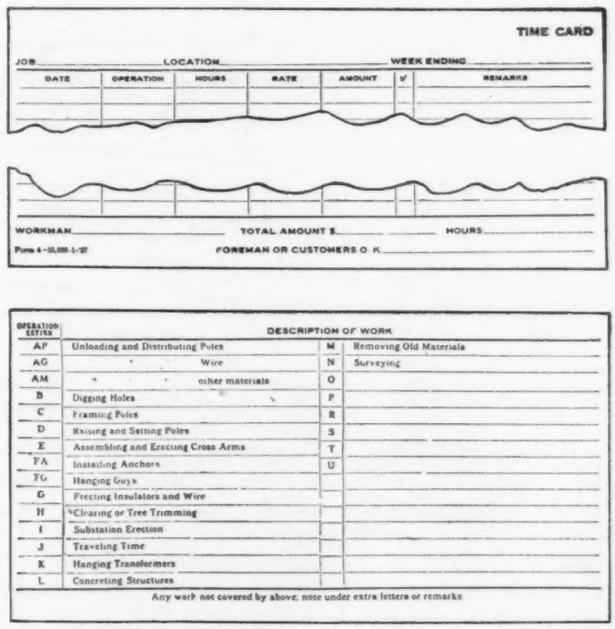
If unsatisfactory conditions exist the reports should set them forth in such a manner that they cannot possibly be overlooked, not buried in a mass of inconsequential detail. A system which is simple, efficient and economical and makes possible an analysis of "costs to date" and "costs for periodic interval" is very valuable and essential for most economical operation.

The system outlined in this article, while not as elaborate as many now in use, has been found satisfactory. Many systems provide for only the accumulation of expenditures and the total costs; others subdivide the total cost into more or less detail.

Checking Excessive Costs

It is, of course, of value to know in detail the cost of the completed line. However, it is of far greater importance and value to know while the job is in progress whether or not it is being done within the estimate. When this information is available excessive costs are immediately brought to attention and remedial measures may be taken.

The first step is to separate the jobs into units or operations, which in the case of wood pole line erection would be digging holes, setting poles, etc. This separation may be made in great detail; however, it is usually sufficient for practical purposes to segregate only the major functions or those performed by separate crews.



TIME CARD

JOB _____ LOCATION _____ WEEK ENDING _____

DATE	OPERATION	HOURS	RATE	AMOUNT	✓	REMARKS

WORKMAN _____ TOTAL AMOUNT $ _____ HOURS _____

Form 4—15,000-1-'27 FOREMAN OR CUSTOMER'S O. K. _____

OPERATION LETTER	DESCRIPTION OF WORK		
AP	Unloading and Distributing Poles	M	Removing Old Materials
AG	" Wire	N	Surveying
AM	" other materials	O	
B	Digging Holes	P	
C	Framing Poles	R	
D	Raising and Setting Poles	S	
E	Assembling and Erecting Cross Arms	T	
FA	Installing Anchors	U	
FG	Hanging Guys		
G	Erecting Insulators and Wire		
H	*Clearing or Tree Trimming		
I	Substation Erection		
J	Traveling Time		
K	Hanging Transformers		
L	Concreting Structures		

Any work not covered by above, note under extra letters or remarks

Combined daily and weekly time card filled out by foreman

Excessive details render a system cumbersome and have a tendency to make employees feel that it is just a lot of "red tape," with the result that reports, etc., are made out more or less haphazardly, with a corresponding decrease in their accuracy.

The factor of "employee interest" should always be kept in mind because the smooth functioning of the system is dependent to a great extent upon interested and enthusiastic employees.

The units used by this company for wood pole line construction are shown in the illustration of the combined daily and weekly time card. The various operations are given a code letter or number to facilitate record keeping. A code using letters instead of numerals has the advantage of eliminating the possibility of confusing the code with other figures.

The system in use by the Hoosier Engineering Company distributes the burden of record keeping so that one person is not unduly burdened with this detail. The crew foremen do their own time keeping and make up their payrolls, unless the gangs are unusually large, making it necessary for them to have a time keeper. The payroll is turned in to the general foreman.

As a rule, the general foremen are authorized to draw checks against the company field bank account and pay off their crews. They also pay for all miscellaneous sup-

TRUCK AND GARAGE DETAIL

TRUCK No. DESCRIPTION

Julian Form 17-30

	GAS		OIL		REPAIRS		MISCELLANEOUS		OPERATION		TOTALS	
	Gallons	Cost	Pints	Cost	Tires	Mechanical	Grease	All Other	Hours	Miles	For Week	To Date
1												
2												
3												

Truck expense ledger sheet

TRUCK AND TIME EXPENSE REPORT

JOB _____ TRUCK NO. _____ WEEK ENDING _____

DAY	OPERATION	HOURS	GASOLINE		OIL		TIRE EXPENSE	REPAIRS		MISCEL
			GALS	COST	PTS	COST		MATERIAL	LABOR	
FRI										
SAT										
SUN										
MON										
TUES										
WED										
THURS										
TOTALS										

Truck expense receipts, or orders supporting the total amount of expense for week, must be attached. Be sure to fill in operations.
The total of your truck time and expense reports must equal the total of T & G Column on your financial report for the week

MILES FOR WEEK _____ TOTAL EXPENSE _____ DRIVER _____

REMARKS _____ FOREMAN _____

Form 20 BM 4 27 (OVER)

Truck time card

plies which they purchase, such as tools, gas and oil. On large jobs field clerks take care of the detail clerical work for the general foreman. In case of a crew being isolated, the crew foreman takes care of this work. On jobs where the work is in one locality the disbursements are made by the field auditor. A receipt must be obtained in each case and a special receipt form is provided for gas and oil purchases. This is done to make possible accurate truck expense and performance records in conjunction with other cost accounting.

The foremen are also required to turn in a time card for each truck, showing thereon quantity and cost of gas and oil used, miles run, hours used and operations by code that the truck was engaged in. A weekly time card is used for both men and trucks. The forms used for labor and for trucks are shown here. Time cards are made up in book form, perforated on the left margin and are pocket size. These cards are filled in daily, making it very easy to figure total time at the end of the week. The week ends on Thursday and the men are paid on Saturday. The entire system is based upon minimum complexity of accounting by field men.

After the foreman has made up his payroll, made out the pay checks and checks covering all other expenses, he makes out his weekly financial report. This report, together with the time cards and receipts for miscellaneous expenditures, is sent to the field office on Friday morning, if possible. The time cards, receipts and financial reports are immediately audited and the total expenditures made on each account are wired to the home office, which in turn deposits the amount wired to the field bank account.

Receipt form used for expenditures chargeable to truck

Form 20-BM-5-15-'36. _____ 192__

Bought of _____

Truck No. _____ By _____

GALLONS GASOLINE			
QUARTS OIL			
REPAIRS AND PARTS			
TIRES AND TUBES			
TOTAL			

Received Payment _____ Date _____

WEEKLY FINANCIAL REPORT

INSTRUCTIONS: This Report to be filled out by each employee making disbursements at the close of each week and approved by general foreman or field auditor and then forwarded to Indianapolis by General Foreman or Field Auditor. If you have more than one sheet, fill in spaces at bottom of each sheet.

Sufficient explanation should be given for miscellaneous checks written so that the Indianapolis office will know what was purchased by these checks.

There must be a receipt or time card for each check written. Be sure that the amount shown on the receipt or time card is the same as shown below for check paying such salary or expense.

The total of your truck and time expense reports must equal the total of your Truck and Garage column.

EXPENDITURES

CHECK NO.	PAYABLE TO	FOR	AMOUNT LABOR	MISC	TRUCK AND GARAGE	DEDUCTIONS	TOTALS
		Total Expenditure					

Signed _____ Approved _____

Week Ending _____ Sheet No. _____ Job No. _____

Form 9-B—1921-'37

Financial report filled out by foreman weekly

account being reimbursed weekly, it should always be in balance.

After wiring in the amount of disbursements, the field office makes an analysis of all expenditures made by each foreman, classifying them by operation. One copy of this analysis is sent to the home office. After the analysis has been made out it is entered in the field office job cost book.

The cost record is a columnar book of conventional design and is merely a medium for recapitulating the charges to each operation and shows the expenditures for each week and to date. A duplicate of this book is kept in the home office. The total expenditures as shown by the cost book balance with the conventional "Work in Progress" controlling account. Expenditures made by the home office chargeable to the job are transmitted to the field office monthly. At the end of each month a trial balance of the job is sent to the field office in order that its accounts may be properly balanced. The field office assembles all data and makes reports upon its construction activities and costs weekly.

Equipment depreciation, insurance, and so forth, are estimated weekly by the field office and entered in its cost books. These items are entered in the home office cost record monthly or when incurred. The field office is required to send to the home office weekly a detailed list of expenditures, including estimated items such as depreciation and insurance, together with a statement showing progress of work from which the percentage of completion and the average cost per unit of work done can be readily obtained.

A weekly report, such as outlined, makes possible an exceptionally satisfactory method of keeping posted on progress made and whether or not the work is being economically done. In conjunction with keeping job costs, the field office is required to keep operating costs of trucks.

Pressure Tests Improve Performance of Outdoor Equipment

By H. A. P. Langstaff
Relay Engineer West Penn Power Company, Pittsburgh, Pa.

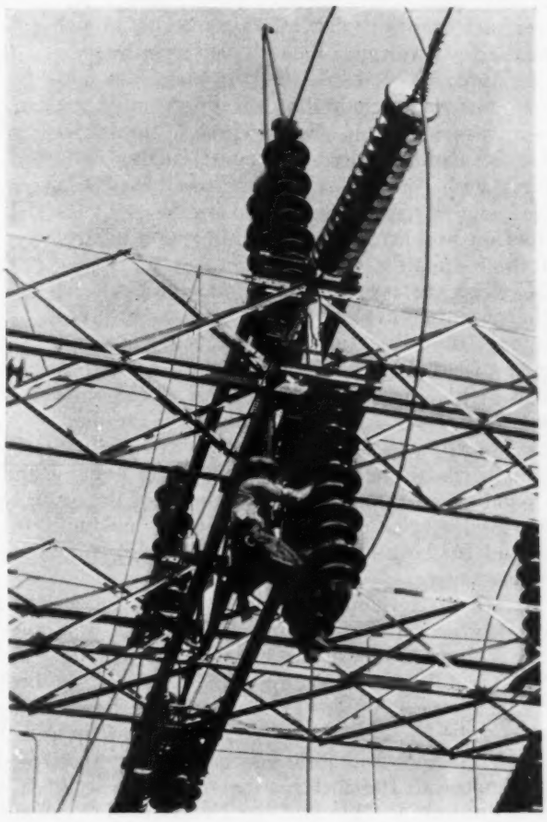
ONE OF the frequent causes of trouble in outdoor electrical equipment, including transformers and oil circuit breakers, is the entrance of moisture. This may occur either at vents through which moist air may enter and the water condense on the tops and walls of the tanks and thereby get into the oil or through porous welds, pinholes, cracks and faulty gasket joints. One economical means of locating faulty welds and pin holes involves an air pressure test in connection with the use of a soap solution. Such a system is used by the West Penn Power Company. In order to apply this test it is necessary first to remove the paint from outside surfaces by using a good paint remover and a stiff wire brush.

Paint should be removed from all welds in order that the faults may not be sealed up, in which case they would, no doubt, show up at a later date. All vents and other normal entrances to the tank are then closed tightly and an air pressure of between 15 and 50 lb. per square inch is applied. The amount of pressure which may be applied to the various pieces of equipment depends largely upon the design of the equipment and the capacity of the air pumps available. Care should be taken not to stress the bolts on manhole covers, bushings, etc., beyond their limit of elasticity.

With this air pressure in the tank the welds are then painted with a strong solution of liquid soap and water. Any defects in the weld or tank will show up in the form of bubbles. In case of a porous weld these bubbles will be grouped and in the case of pinholes will be isolated. If the leak is caused by a pinhole it can usually be calked. However, if it is caused by a porous weld we have found it necessary usually to chip out all that part of the weld which is faulty and to reweld it. Maintenance charges can be greatly reduced by such a program of tests, especially on older type of outdoor equipment.

220-Kv. Insulators Cleaned with Steel Wool

BECAUSE of dust and dirt deposits on 220-kv. insulators which might cause flashovers at the Vaca-Dixon substation of the Pacific Gas & Electric Company, it has been found necessary to wash insulators about once a year. Trial of several methods of washing has led to



Workman seated in boatswain's chair cleaning 220-kv. post-type insulator with steel wool to remove hardened dust deposits

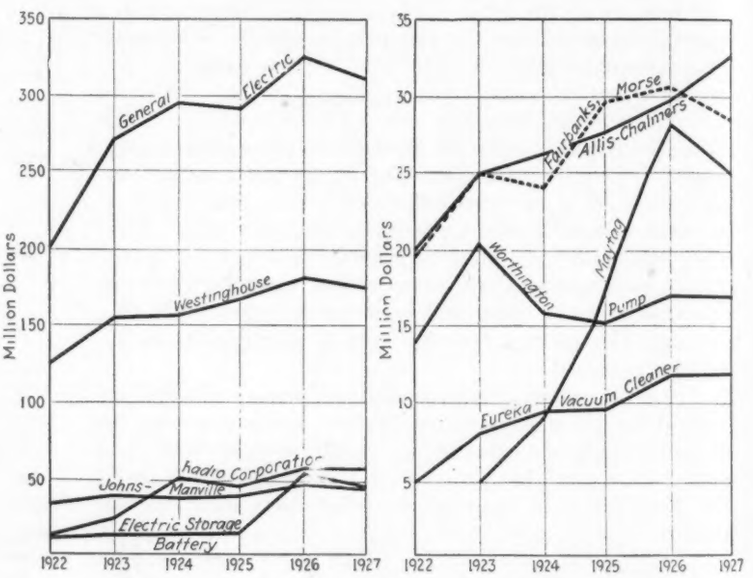
the practice of using medium steel wool and lava soap. The soap is used more as a lubricant than because of its scouring properties. After washing the insulators are wiped with a dry cloth. No trouble has been experienced from the steel wool scratching the porcelain glaze, yet it has sufficient abrasive properties to remove the hardening deposits quickly and effectively.

Upward Trend in
Earnings of Manufacturers

Financial record of leaders in field throws light on current position. Distribution and credit problems are still difficult. Appliance situation mixed

By H. M. CAMERON
Associate Editor ELECTRICAL WORLD

WHAT is the current earnings position and outlook for America's leading electrical manufacturing concerns? What future have the smaller producers in the face of existing keen competition? Are many appliance producers able to overcome their credit and distribution problems? An attempt to answer such questions discloses a somewhat mixed situation. Naturally wide variation in magnitude, type of products, field of operation and other factors preclude direct comparison of the companies involved. But a cross-section view of the earnings status of manufacturing concerns, with comparisons where feasible, and a brief analysis of some of the credit and distribution problems give something of a picture of the industry's trend.



Six-year sales record of a group of larger manufacturers

On the surface, the situation could not be otherwise than healthy and prosperous with the nation's central-station industry spending upward of a billion dollars yearly for development, with railway electrification calling for expenditures of a hundred millions in the next three years, with the electrification of industry going on in all parts of the country, with rising living standards demanding an ever-increasing volume of domestic equipment and service of every description and with foreign demand for both industrial and household equipment expanding apace.

All these developments must reflect favorably upon the electrical manufacturing industry as a whole. A large volume of business inevitably arises out of such projects as the electrification of Cleveland's terminal and of Chicago's terminal. Then, again, the Pennsylvania is stated to be contemplating electrification of its lines from New York to Washington and has recently electrified the Wilmington to Philadelphia division of these lines, while the Baltimore & Ohio and the Delaware, Lackawanna & Western and also several other railroads have electrification projects under consideration. In other lines a good volume of business is looked for in electrical equipment for marine purposes—in electrical arc-welding apparatus, in radio and in equipment for the talking movies.

The volume of present business and the rapid introduction of new electrical applications affords a most encouraging outlook for electric equipment producers. All should prosper, even though competition in certain lines of equipment and accessories is exceedingly keen. Among the smaller producers there are also distribution difficulties to be overcome and the picture is not one of unmixed prosperity. Quality in management, however, is the best aid to prosperity, and where this exists there need be no fear with regard to business prosperity.

POSITION OF THE LEADERS

The General Electric Company and Westinghouse Electric & Manufacturing Company, standing in a position far ahead of any of the other companies in size, have a combined annual gross of half a billion dollars. The former reached its peak year in 1926 with total billings of $326,974,103. In 1927 keen competition, lower prices and other factors cut the total down to $312,603,772. Westinghouse also reached its peak of $185,543,087 billings in 1926 and dropped off to $175,456,815 last year. A comparison of the growth curves of these two shows that the smaller has increased less rapidly in earning power and more rapidly in capitalization. It has been making extensive property improvements, which, of course, will ultimately increase earnings. Expenditures for additions to plant and equipment during the past six years totaled approximately $40,000,000. All this has necessitated substantial additions to capital during the period. The General Electric Company, on the other hand, has made no increase in common stock outstanding since 1923. General Electric's per share earnings last year amounted to $6.41, against $6.15 in 1926, while Westinghouse earned $6.69 last year and $6.91 in

1926. While both companies showed a decline in gross during 1927, General Electric earned 11½ cents on each dollar of sales, against 11.35 cents in 1926, and Westinghouse earned 8 cents, against 8½ cents in 1926.

This year to date a satisfactory increase is shown over the 1927 totals and the outlook is that both companies will approach or exceed their previous high records both in business and in earnings. Total billings of the General Electric Company for the first half of 1928 established a new record for a six-month period—$158,015,221, which is 5.4 per cent over the figure for the first half of last year and 7.1 per cent over the same period of 1926. The Westinghouse half year total was $86,898,851, which is an increase of 5.2 per cent over the same period of 1927, but 2.3 per cent below the first half of 1926. Turning to business booked, General Electric shows a gain of 9.4 per cent over the first half of 1926, while Westinghouse showed a fractional decline. Business for the third quarter is shown elsewhere in this issue.

Medium-Sized Companies Show Growth

In the next group of companies engaged partially or solely in electrical manufacturing are included, for convenience, those with business of ten millions and upward. Broadly speaking, and with the modifications implied in what is said later under "appliance companies," this group shows a healthy and expanding earnings position. Space naturally precludes individual treatment of the entire group, but some enlargement in the case of one or two companies suggests itself.

An outstanding member of the group and one which has shown steady growth during the past five years is the Allis-Chalmers Manufacturing Company. Earnings of this company last year amounted to $10.02 per common share, against $9.39 the year before. During the first half of this year earnings amounted to $5.69, against $4.25 for the first half of 1927. Sales have increased steadily from about $21,000,000 in 1922 to over $33,000,000 in 1927 and around $17,000,000 for the first half of 1928. Surplus has been built up steadily and now stands at around $17,000,000. The company has a wide diversity of products in electrical and industrial machinery, to which important additions have been made by the acquisition of Pittsburgh Transformer and Monarch Tractors. In 1924 the company purchased the mining, crushing, cement and creosoting machinery department of the Worthington Pump & Machinery Corporation.

Another rapidly developing manufacturing company, but one which confines itself largely to one class of product, washing equipment, is the Maytag company. While net sales of this company fell off sharply last year, this is likely to be more than made up by present satisfactory business. Current sales are well ahead of this time last year. Sales for July and August were reported to be 40 per cent over corresponding months last year due to the benefits being derived from a new shipment policy initiated early this year.

Credit Overextended in Appliance Field

Turning to the appliance industry, there was a slight recession in the volume of business done last year, both in number of units and in dollars, with the exception of refrigeration. During the first quarter of the current year sales pressure was exerted by manufacturers and dealers to increase the volume in those lines which had suffered last year. This resulted in an overextension of credit and an increased amount of receivables on the part of manufacturers. Whether such sales pressure was a factor in the financial troubles through which the dealers have been passing is outside our present inquiry.

A brief discussion of some of the current dealer problems is, however, pertinent. Following the situation just outlined, the second and third quarters of the year were marked by several large bankruptcies, notably that of the largest chain yet known to this field, the Service Appliance Company. After a protracted period of attempting reorganization the company was finally brought into the bankruptcy courts in September with liabilities in excess of $2,500,000. Several other large dealers in the Middle West and Northwest have also failed for substantial sums, and a number of other large dealers have been taken over by the manufacturers or are now in the hands of creditors' committees.

The cause of this situation is one which concerns the manufacturer indirectly. It would seem that the previous prosperity of this class of retailers was based on a steady upward trend of business and on a continued increase in sales. Much of the business was on the installment basis. Many of the finance companies which discounted the paper involved were careless in the extension of credit and negligent in following up collections.

With the period of business readjustment, decreased employment and some recession in public buying, a more conservative business policy has become necessary. The finance companies have been and are continuing to exert pressure to put their business on a more sound and conservative basis.

A survey of the appliance field suggests the following comments with regard to the chief lines:

Washing Machines.—In number of units, the sales of electric washing machines for 1928 will probably be as

Earnings and Stock Market Record of Leading Group of Manufacturers

	Gross Sales (000 Omitted)			Change 1926 to 1927	Common Stock 1926		Common Stock 1927		Earned on Common	
	1925	1926	1927	Per Cent	High	Low	High	Low	1926	1927
General Electric Co.	$290,290	$326,974	$312,603	—4	95	79	146	81	$6.15	$6.41
Westinghouse Elec. & Manufacturing Co.	166,006	185,543	175,456	—5	79	65	95	67	6.91	6.69
Radio Corporation of America	46,251	56,093	56,651	+1	61	32	101	41	2.85	6.15
Electric Storage Battery Co.	13,980	54,199	45,640	—16	94	71	81	63	7.31	7.09
Johns-Manville, Inc. (2)	39,201	45,042	44,313	—2	..	..	..	..	5.77	4.78
Union Carbide & Carbon Corp (1)	28,267	32,834	34,195	+4	100	78	154	98	9.08	9.53
Long-Bell Lumber Co. (Class A stock)	41,367	39,402	34,589	—12	50	41	43	25	4.58	2.52
Allis-Chalmers Mfg. Co.	28,921	30,682	33,352	+9	94	78	118	88	9.39	10.02
Truscon Steel Co.	27,658	31,565	29,213	—7	30	22	34	24	4.25	3.37
Fairbanks, Morse & Co. (2)	29,357	31,550	28,391	—10	59	39	43	20	6.03	3.08
Maytag Co. (2)	17,463	28,722	25,582	—11	24	19	35	33	3.29	2.87
Aluminum Co. of America	.....	.....	*22,612	..	76	54	145	67	....	5.00
Kelvinator Corp. (2)	15,439	17,163	20,122	+17	..	..	..	..	4.34	....
International Combustion Engr. Corp.	9,536	18,415	.....	..	..	..	64	40	2.67	2.21
Worthington Pump & Mchy. Corp.	15,222	17,141	16,520	—4	44	19	46	20	....	....
Timken Roller Bearing Co. (3)	12,466	14,288	14,995	+5	85	44	142	78	7.06	7.96
Eureka Vacuum Cleaner Co. (2)	10,090	12,023	12,780	+6	68	43	77	50	7.52	6.55
American Bosch Magneto Co.	14,279	12,510	7,975	—36	34	16	26	13	2.17	2.26

(1) Net profits after taxes. (2) Net sales. (3) Manufacturing profits. *After operating costs.

great as 1927. In dollars, however, the volume will be somewhat smaller. This is due to the rapid increase in sales of the lower-priced machines, both through the electrical trade and by such general merchandisers as department stores and the mail order houses with their chain of stores.

Refrigerators.—Electric refrigeration sales will show a marked increase over 1927, just as this same equipment showed an increase in 1927 over 1926. The most important development in this field this year has been the strides made by the General Electric Company in the sale of its refrigerating unit. Price reductions among competing refrigerator manufacturers were disturbing factors in 1926 and 1927. This movement has apparently come to an end and prices have stabilized. It is probable that the average price per unit sold for 1928 will be somewhat higher than for 1927. Several of the larger manufacturers and some of the smaller manufacturers in the refrigeration field have gone out of business, have had a small profit year or have practically ceased attempting to promote their product actively, but other manufacturers have had a prosperous year.

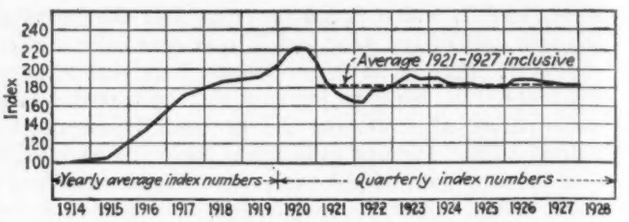
Electric Ranges.—A marked increase in the sale of electric ranges is indicated for 1928 over 1927. One company particularly has had a very large increase in business this year.

Electric Water Heaters.—The electric water heater is making slow progress, but new types, such as the low-wattage storage type, are being perfected from the engineering standpoint and are arousing an interest both with the utilities as an off-peak current consumer and with the public. The range and water heater offer much hope for large energy consumption in the home and are needed to develop this kind of business.

Cost Trend of Electric Light and Power Properties

AMONG the exhibits filed by W. V. Burnell, appraisal manager Stone & Webster, Inc., Boston, before the federal master at Boston in connection with the Worcester Electric Light Company case was a chart showing the variation in reproduction cost from Jan. 1, 1914, to Jan. 1, 1928, of a composite electric light and power property as obtained by the application of Boston cost trend factors for material and labor to each class of property in suitable proportion. This proportionate weight is in accordance with the relative value of each class of property as determined from an analytical study of fourteen light and power properties examined by this organization.

It is apparent that this curve might not be accurately



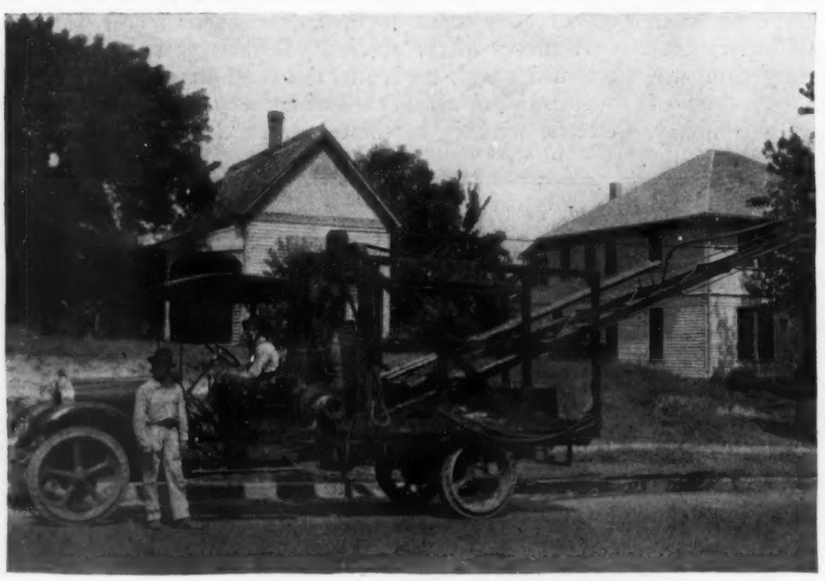
Cost trend with 1914 as 100 index

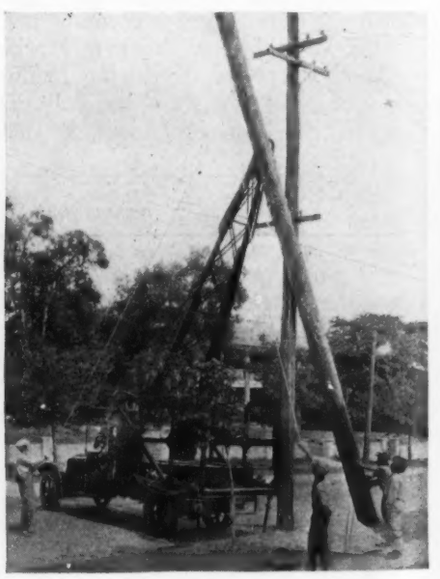
applicable to a particular property, because such a property might vary widely in physical characteristics from the composite group upon which the curve is based, and it might also be situated in a part of the country where the fluctuations in construction cost have differed from those at Boston. But as an expression of the general trend of construction costs for this class of property the curve is significant.

Pole-Setting Equipment

By John Oram
Chief Engineer Dallas Power & Light Company, Dallas, Tex.

ONE of the pole-setting trucks in use on the system of the Dallas Power & Light Company is a 2½-ton White which is equipped with a double-drum winch and two cable lines for hoisting purposes. The frame of the truck is of channel iron with an adjustable boom mounted on the front part of the body to the rear of the winch. The boom is raised and lowered by means of a cable from one of the drums of a winch, the other drum being used to hoist the pole to be set. The cable from the drum is threaded through the boom over a roller in the end and is fastened to the pole. In setting





Pole-raising truck ready for the road and at work

a pole the boom is raised to the desired height and the pole is picked up and swung clear of the ground. The truck then moves to the location where the pole is to be set and lowers the pole into the hole. A novel feature is the eye on the hook. A hand line is attached to this eye by means of a snap. After the pole is in place a pull on the hand line disengages the hook from the loop around the pole. Another feature is the protected end of the boom. The guard rails or fenders at the sides and top are of ½-in. pipe, covered with rubber hose, cambric tape and "P & B" tape, and then shellacked. This insulation reduces the hazard if the boom end is in danger of coming in contact with conductors when a pole is being raised in a line. It takes a crew of four men to operate this truck. Forty-foot creosoted pine poles can be set in about five minutes each.

Letters from Our Readers

Peak-Hour Cost Allocations

To the Editor of the ELECTRICAL WORLD:

The recent article in the ELECTRICAL WORLD "The Complete Peak Method,"* by Messrs. John Oram and H. H. Robison, is worthy of merit. A method of capacity cost allocation designed to encourage off-peak load and power-factor correction and differing from other plans by putting responsibility on systems using power when the load is greater than minimum load has been arbitrarily designated as the "peak-hour" method.

The three fundamental principles which are considered necessary to obtain the desired results are:

(a) The complete capacity cost is allocated to those systems using power during the time the load exceeds the minimum daily load.

(b) The capacity cost should be allocated to systems on peak in direct proportion to the time it is used by each.

(c) Reactive lagging load increases capacity responsibility, while a leading load decreases responsibility provided the total load is lagging.

Let us consider the same six systems used by Oram and Robison. Each system uses 48,000 kw.-hr., but differs in the time of day and load factor. The problem is to allocate the capacity cost equitably.

In allocating the capacity cost let us omit each system in order and note the total capacity of the remaining five. In other words, let us allocate the capacity cost to the systems using power during peak hours.

If *E* is omitted the generating capacity could be reduced by 2,000. Likewise if *B* and *C* are omitted the capacity may be reduced by 4,000. But if *B* alone were omitted the capacity would be reduced by 4,000 kw. Therefore, 4,000 kw. capacity should be allocated to *B* and 0 capacity to *C*. If *F* were omitted it would reduce the capacity by 1,000. *F2* and *A1* are responsible for 3,000. *F2* for eight hours and *A1* for four hours. Therefore, is it not logical to allocate ⅜x3,000 or 2,000 additional to *F*, making a total of 3,000 for *F*? Likewise, *D* is responsible for ⅔x4,000 or 2,667 kw. and *A2* for 1,333 kw. Also *D2* for 2,000 and *A3* for 2,000. This assigns to *D* a total of 2,000 plus 2,667 or 4,667kw. *A4* is responsible for the remaining 1,000 alone, giving a total for *A* of 1,000 plus 1,333 plus 2,000 plus 1,000 equal 5,333. The above is fairly consistent with "The Complete Peak Method" excepting system *C*'s responsibility.

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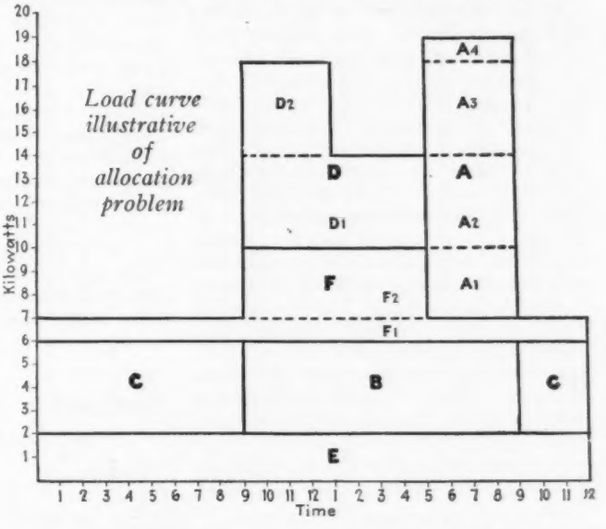
	Peak-Hour Method	Complete Peak Method	Time
A	5,333	5,055	Wholly "on peak"
B	4,000	3,336	Wholly "on peak"
C	0	2,000	Wholly "off peak"
D	4,667	3,882	Wholly "on peak"
E	2,000	2,000	Part "on peak"
F	3,000	2,757	Part "on peak"

The peak-hour method places the responsibility on the systems responsible for the peak. Since *C* reduces the peak, it seems obvious that they are without responsibility. It is recognized that *C* is the most desirable load in any system having a peak. This consideration should encourage off-peak load.

Now let us assume that *F* maintains an 80 per cent leading power factor, while *D* and *A* maintain 80 per cent lagging and *E* and *B* unity.

Between 9 a.m. and 1 p.m. *D*'s demand would be 10,000 kva. and between 1 p.m. and 5 p.m. 5,000 kva. *A*'s demand would be 15,000 kva. *F* would neutralize 1,000 kva. of the reactive load from 9 a.m. to 9 p.m.



The results obtained as explained for unity power factor would be: *A*, 7,167; *B*, 4,000; *C*, 70; *D*, 5,834; *E*, 2,000, and *F*, 2,000.

This allocation would encourage unity power factor and is equitable, since capacity is rated in kilovolt-amperes.

The true test of any method of capacity cost allocation must be based on the relative effects on the rate per kilowatt-hour. The "demand cost per kilowatt" means little, since the element of time is wholly disregarded. Limits must be recognized to which the "off-peak" load can be encouraged or else the natural peak load is liable to be suppressed.

Let us assume a capacity cost of $5 per kilowatt for the system under consideration:

	Relative Capacity Responsibility Peak-Hour Method	Capacity Cost	Kilowatt-Hours	Maximum Demand	Capacity Cost per Kilowatt	Capacity Cost per Kilowatt-Hour
A	5,333	26,665	48,000	12,000	$2.22	$0.556
B	4,000	20,000	48,000	4,000	5.000	0.417
C	0	0	48,000	4,000	0.00	0.00
D	4,667	23,335	48,000	8,000	2.92	0.486
E	2,000	10,000	48,000	2,000	5.00	0.208
F	3,000	15,000	48,000	4,000	3.75	0.312

While the cost per kilowatt demand seems to be reversed, the relative cost per kilowatt-hour is in the correct order; i.e., *A, D, B, F, E, C.*

Hamilton, Ohio. ALFRED SIMPSON.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Power-Station Betterment. — The prime movers committee of the N.E.L.A. in issuing its serial report has divided the power-station betterment activities into two main classes. Changes in the procedure of handling existing equipment so that a higher degree of efficiency may be obtained is the first of the classifications. Changes in the equipment installed either by the entire substitution of part of the apparatus or the addition of heat-reclaiming devices to the existing equipment is the second item. The various items entering into the problem of bettering the operating conditions of an existing plant have been enumerated as physical performance of plant, production cost for plant, housekeeping procedures, training of personnel, standardization of operating procedures, standardization of plant records, and budgeting operating costs. Each of these divisions has been discussed separately, although it is recognized that it is almost impossible to make a definite separation between the items since they overlap to a considerable extent. The checking of plant economy in four member company organizations and recommendations developed as the result have been included. Three distinct methods for determining the economy of station operation upon a different basis have likewise been included.—*Report National Electric Light Association,* September, 1928.

Units, Measurements and Instruments

Recent Applications of the Electric Micrometer.—A. V. MERSHON.—It is pointed out by the author that the mass of a large steam turbine rotor must be carefully balanced in order to obtain smooth running. Where the peripheral speed is high, the balance must be very nearly perfect so that large unbalanced forces will not exist. A good balance would correspond to only a few thousandths of an inch radial motion in the rotor of a turbine. In such cases the electric micrometer has been used to measure shaft movements in the order of 0.0001 in. or greater. The electric micrometer, furthermore, will measure rapid changes in water pressures in inaccessible parts of waterwheel turbines. Mechanical devices will not follow changes in pressure that are as rapid as one hundredth of a second. The electric micrometer has been used also on household refrigerator units to measure the pressure changes that take place during one stroke of the piston operating in a sealed vessel. An indicator card was obtained showing the changes in pressure for this determination. The instrument used for this purpose is described by the author and the characteristic applications and curves as derived by its use have been included.—*General Electric Review,* October, 1928.

Thermoelectric Measurement of Temperatures Above 1,500 Deg. C.—H. L. WATSON and H. ABRAMS.—After a brief discussion of the standard methods of temperature measurement from 1,000 to 2,000 deg. C. an account is given of a tungsten graphite thermocouple, including its construction, characteristics and application. This couple has been used, with suitable protection, to over 1,700 deg. C. in oxidizing atmospheres. Repeated runs to 1,850 deg. C. have been made in the vacuum furnace, as well as short runs to about 2,400 deg. C. at atmospheric pressure in reducing atmospheres. The elements when properly selected and treated are interchangeable within 5 per cent and an expression has been obtained for the temperature - emf. relation over the useful range. Automatic recording and control of furnace temperatures in ceramics and steel making have been made possible by use of this couple.—*Report American Electrochemical Society,* September, 1928.

Generation, Control, Switching and Protection

Improvements in Moderate Capacity Oil Circuit Breakers.—J. B. MACNEILL.—The increased duty requirements of power station service require circuit breaker design to give maximum interrupting capacity in a minimum of space. Compact, relatively high-power breakers having all three poles in a single round tank have been designed. In addition to increasing the rating for a stipulated space these give improved performance over types previously available, according to the author, and the relations of the current carrying loops inside the breaker and the diversity factor afforded by the common oil volume and air space give superior results in operation. This type of design permits use in current ranges where decreased arc energy as compared to power handled can be secured. It is contended that the common air volume tends to diminish the shock to the breaker structure that occurs on single-phase short circuits, that the maximum pressures to which the pressure may be subjected are considerable, but that the average pressure under operating conditions will be reduced. In general, it is felt that less maintenance for a given duty will be required with this form of breaker than with the multiple, single-pole breaker and also that the maintenance is more easily and quickly performed.—*Journal of the American Institute of Electrical Engineers,* October, 1928.

Transmission, Substations and Distribution

Conduit and Manhole Construction.—A number of developments have recently been made in conduit construction practices, including long duct sections and increase in duct size. Monolithic concrete cableways, buried cable installations, cable sheath troubles at duct entrances, effect of networking on transformer manhole design, lowering long duct bank intact, concrete manhole construction with a rising steel form, precast concrete manholes and service boxes are some of the topics considered in this report of the underground systems committee of the N.E.L.A. Installation economies, simplified operation, improved service and less damage to cable sections are some of the advantages of the procedures discussed.—*Report National Electric Light Association,* September, 1928.

Substation Density.—C. G. WATSON.—A rapid and simple approximate method for determining the number of substations that will entail least expenditure on a distribution system is offered by the author in connection with a practical illustration on the layout and distribution facilities for a definite area. It has been assumed that the primary distribution shall be by high-tension mains originating from a center which may be a generating station or the point of receipt of a bulk supply; that the high-tension mains feed substations wherein the high-tension supply is converted to low tension for distribution to consumers and that the low-tension feeders radiate from the substations to equally spaced points on a distributing network. In such a system the cost of a low-tension network may be considered as a fixed quantity. Therefore, in any comparison of economic advantage its cost may be neglected. With a given load the cost of the low-tension feeders will vary with the number and consequently the cost of the substations. In fact, as the cost of the substations goes up the cost of the low-tension feeders goes down. That is to say, there is an optimum number of substations to secure least capital expenditure. — *Electrician (England),* Sept. 14, 1928.

Illumination

The Physiological Fundamentals of Street Lighting.—L. SCHNEIDER.—The process by which objects are seen in a street by natural and artificial lighting is traced back to the five primary sensitivities of the eye, namely, contrast sensitivity, form sensitivity, perception time, speed of contrast perception and speed of form recognition. It is established that seeing by silhouette, which has hitherto been considered only for

the case of artificial lighting, occurs also in natural lighting and represents the changeover from form sensitivity and speed of form recognition to contrast perception respectively. An attempt is made to establish a relationship between the conditions arising from the method and speed of braking of motor vehicles and the sensitivities of the eye such as will provide a basis for the appraisement of street lighting.—*Report International Illumination Congress,* September, 1928.

Trend in the Illumination of Industrial Plants.—KIRK M. REID.—Illumination practices in a number of typical industrial plants have been reviewed in connection with the lighting requirements for specific manufacturing operations. The importance of correct illumination for satisfactory results, both as to quality and quantity of production, have accompanied this exposition of present practices in lighting work.—*Industrial Engineering,* October, 1928.

Motors and Control

Choice of Motor Size for Intermittent Duty.—F. HARTIG.—The nameplate of a motor gives no clue as to the capacity of the machine for short duration and intermittent drives, such as occur commonly for a great variety of steel mill machinery. Cranes, feeding rolls, ladle motors, shears, mixers, guide rails, etc., are in operation only a few seconds at a time, with corresponding periods of idleness, to dissipate their heat. A time study was made on such drives in a large steel mill, and the recorded data are tabulated for thirteen typical operations. Simple mathematical formulas are then derived from these practical results, presented in curve form, to be generally applicable. By means of two examples, one a motor-driven guide rail, the other a 10-ton crane, the writer indicates how to use the given data to choose from standard list motors the correct size of motor for the selected duty cycle. — *Elektrotechnische Zeitschrift,* Sept. 20, 1928.

Heat Applications and Material Handling

Theory and Data on High-Frequency Furnaces.—M. DUFOUR and M. BUNET.—The authors present a highly mathematical theory of high-frequency induction furnaces, such as are used in small laboratory sizes and medium commercial types for melting metals and alloys. The article covers the subject in an exceedingly thorough manner and gives in the last few chapters practical values to explain in a concrete way the theoretical developments. The design of spark gaps, used in connection with the oscillating circuit of high-frequency furnaces, has also been discussed. Mercury electrode gaps, rotating disk gaps and, in particular, an air-jet-blown revolving disk gap, the latter construction for furnaces, consuming up to 100-kva. single-phase input, are among the topics treated. With the exception of the design of the furnace itself, the discussion includes all information necessary for determining the characteristics of any high-frequency furnace. — *Bulletin de l'Association Francaise des Electriciens,* September, 1928.

Electrophysics, Electrochemistry and Batteries

Methods of Test Relating to Electrical Insulating Materials.—As the result of an investigation extending over a period of several years the committee of the A.S.T.M. presents what are believed to be the best methods for the testing of insulating material which are available at the present time. The discussion covers both tentative and standard practices and includes a consideration of the examining of the properties of molded materials, oils, varnishes, porcelains, paints, cable splices, pothead compounds, sheet materials, cloth tapes, rubber gloves, rubber matting and similar materials with dielectric properties.—*Committee Report American Society for Testing Materials,* 1928.

The Magnetic Field Intensity at Any Point in the Plane of a Circular Loop.—ALBERT P. STROM.—An analytical consideration of the electrical conditions involved in the calculations of field intensity at any point in a circular loop in which an electric current flows. The author has avoided the more elementary statement of this problem and has taken up the mathematical considerations involved in the general case. A number of equations expressing the divisions involved have been developed and certain conclusions drawn with regard to previous determinations and the various discrepancies in the present equation.—*Journal of the Franklin Institute,* September, 1928.

Traction

D.C.-D.C. Converters for Locomotives.—D. I. TURBER.—While voltages of 1,000 to 3,000 are standard on direct-current locomotives, safety and economic design make it desirable to provide low-voltage direct current for the operation of the auxiliaries, such as compressor motors, fans, remote control, light and heat. Numerous designs of motor-generators and single armature direct-current to direct-current rotary converters are known and used and are the subject of this paper. These sets are usually of 3 to 5 kw. output and for 25 to 550-volt secondary voltage. It seems that no matter what type of converter is installed on the locomotive, it always represents a somewhat vulnerable part of the equipment. Variations of the trolley voltage within wide limits, dancing of the pantograph, short interruptions, etc., impose upon the sets adverse operating conditions, which may lead to trouble. Before adopting such converters it is recommended to carefully investigate the possible advantage of an axle-driven generator and storage battery.—*Elektrotechnische Zeitschrift,* Sept. 6, 1928.

Telegraphy, Telephony, Radio and Signals

Current Supply for Small Telephone Exchanges.—K. SCHMIDT.—The previously used arrangement, that of having the current supply in small exchanges consist of two storage batteries, one discharging while the other one is being charged, is gradually falling into disuse, preference being given now to a single battery, floating on a direct-current supply from either a rectifier or a motor-generator. The author investigates technical advantages, efficiencies and economy of the latter plan and comes to the conclusion that the generator is in all respects more to be recommended than the glass bulb mercury-arc retifier. For the low voltages required for this service, 24 to 65 volt, using a rectifier with necessary iron core reactor, an average and over-all efficiency of 57 per cent is rarely exceeded, while it sinks to 30 to 40 per cent when cathode rectifiers are chosen. The average bulb will, it is said, last 1,500 hours, while a modern motor-generator of equivalent size will run unattended for 6,000 hours and more. The installation cost of a motor-generator is about the same as that of a rectifier, but it is customary to guard against service interruptions with rectifier operation by installing a spare bulb, in which case the initial cost for the latter supply is higher than for the machine set.—*Elektrotechnische Zeitschrift,* Sept. 13, 1928.

Miscellaneous

Accelerated Laboratory Corrosion Test Methods for Zinc-Coated Steel.—EDWARD C. GROESBECK and WILLIAM A. TUCKER.—An investigation of two types of accelerated laboratory testing methods for evaluating the indicated life of the coating on hot-dip zinc-coated sheet steel was undertaken. The methods studied simulated atmospheric corrosion, using a moist gaseous mixture of sulphur dioxide, carbon dioxide and air, and utilized a spray of normal solutions of sodium chloride and ammonium chloride separately. A consistent relationship between the life and weight of the coating was shown by the results. The time required for the breaking down of the coating under the air test was considerably greater than that for the spray test. No attempt was made to interpret the experimental results in terms of service life in various types of atmospheres prevailing in different climates. The presence or absence of about two-tenths of 1 per cent copper in the steel base produced no apparent effect on the results. Tests were also made on specimens which had been annealed for the purpose of converting the zinc coating into an iron-zinc alloy.—*Bureau of Standards Journal of Research,* August, 1928.

News of the Industry

Court Upholds Sale of Small Maryland Companies

Holding that no evidence had been given to show that purchase by the Electric Public Utilities Company of Chicago of four small western Maryland power companies would be detrimental to the public interests, the Circuit Court at Baltimore on Oct. 30 ordered the case remanded to the Maryland Public Service Commission for authorization of the sale. The fight of the Chicago company to obtain control of the smaller companies has continued for more than a year before the commission and the courts of the state. Its progress has been recorded in the ELECTRICAL WORLD.

The price the Chicago concern proposes to pay for the four companies is $518,000. The companies are the Home Electric Company of Lonaconing, the Emmitsburg Electric Company, the Antietam Electric Light & Power Company and the Midland Electric Company.

The commission held that the transfer of the properties would be detrimental to the public interest, on the ground that the purchase price was inflated and eventually would be reflected in rates charged customers of the companies. The court held that there was no evidence to substantiate the claim of the commission. An appeal may be taken by the latter.

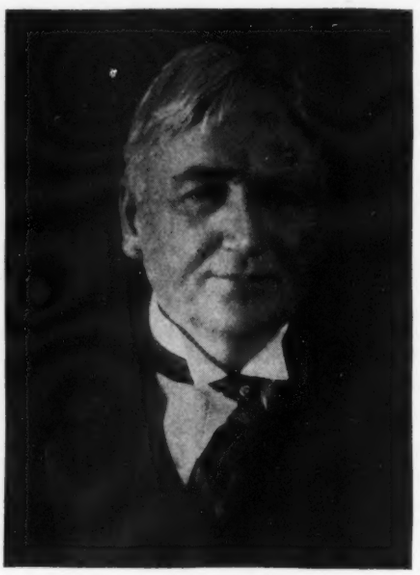
Pennsylvania Railroad Tells Electrification Plans

Further details of its plans for the electrification of its main line from New York City to Wilmington, Del., have been made public by the Pennsylvania Railroad. Both passenger and freight service on 325 miles of line and 1,300 miles of track are included, and an expenditure of $100,000,000 in the next seven or eight years is indicated. At present the Pennsylvania Railroad is electrified between the Sunnyside yards at Long Island City, N. Y., and Manhattan Transfer, east of Newark, N. J., and from Philadelphia to Wilmington. The latter section has just been completed. The next step will be electrification of the road between Philadelphia and Trenton, which will be completed about 1930. The Newark to New Brunswick section will then be put through in a year or a year and a half, after which the Trenton to New Brunswick section will be completed.

Overhead construction and electric locomotives will be employed. Arrangements have been made by the Pennsylvania Railroad to purchase quantities of power from the Public Service Corporation of New Jersey and the Philadelphia Electric Company. If conditions warrant it, the electrification of the road's entire 11,000 miles of trackage will be planned section by section upon completion of the present plans, said President W. W. Atterbury.

Arthur Williams Resigns

Vice-President of New York Edison Retires from That Company After 45 Years of Service—His Career and Interests



Arthur Williams

ARTHUR WILLIAMS, vice-president of the New York Edison Company in charge of commercial relations, announced his resignation of that office on Thursday of this week in order that he may have more time to devote to his numerous outside interests.

Mr. Williams' resignation follows an association with the New York Edison Company which covers a period of almost 45 years. For a long time he has been a national figure in the activities of the electrical industry, and his contributions to the progress of its various branches have won frequent recognition. In the course of his career he has been president of the National Electric Light Association, the Association of Edison Electric Illuminating Companies, the New York Electrical Society and the New York Electrical League. He is at this time president of the Electrical Show Company, under whose direction the annual New York Electrical and Industrial Exposition is held, and of the New York Electrical Board of Trade.

Born in Norfolk, Va., just 60 years ago, and educated in New York City, Brooklyn and Hartford, Arthur Williams was as a youth attracted by the dawning possibilities of the electrical art and on leaving school became identified in 1884 with Rennie & Smith, wiring contractors for the old New York Edison Electric Illuminating Company. Early the next year he entered the service of the Edison Electric Illuminating Company. He was closely connected with electrical history as it was made in the old Pearl Street station in the city of New York, the starting point of the electric lighting industry in America. Serving successively as superintendent of interior construction, electrician, superintendent of the third district, superintendent of the underground department and general inspector, Mr. Williams was appointed general agent in 1893 and in 1915 was promoted to be general commercial manager. In 1924 he became a director of the New York Edison Company and vice-president in charge of commercial relations.

In addition to his activities in the electrical industry Mr. Williams has many outside interests of diverse character. He is at the present time or recently has been prominent in the Fifth Avenue Association, the Broadway Association, the National Safety Council, the Chamber of Commerce of the State of New York and the Real Estate Board of New York. He has always taken an active interest in civic movements promoting safety and welfare work, and for his accomplishments in this field has been decorated by the French and Spanish governments. His versatility is shown by the long list of business, social, cultural and recreational associations and clubs to which be belongs. At the time of the World War he was appointed federal food administrator for New York City.

McGraw-Hill Publishing Company Announces Change

Expansion of the McGraw-Hill Publishing Company, Inc., which through merger and purchase in recent months now comprises nine subsidiary and associated companies publishing business and industrial magazines, engineering books, catalogs and directories, has led to action by the board of directors, the company announces, separating the offices of chairman of the board and president of the company, both of which have hitherto been held by James H. McGraw. Under the new plan of organization Mr. McGraw will continue as chairman of the board. Malcolm Muir, formerly vice-president, who has been with the organization for 23 years

and has been identified with many phases of its activities, during the last ten years particularly, has been elected president of the company and chairman of its executive committee. James H. McGraw, Jr., vice-president and treasurer, has been elected vice-chairman of the board and chairman of the company's newly created publishing committee.

No Action Yet Against Bond & Share

Doubt Whether It Will Be Taken Expressed at Capital—Growth of Company and Certain Transactions Are Inquired Into

By Paul Wooton
Washington Correspondent for the Electrical World

NO REQUEST, as this is written, has been made by the Federal Trade Commission upon the Attorney General to start proceedings against the Electric Bond & Share Company for its refusal to furnish the commission with certain expense information which the company contends is not pertinent to the utility investigation or within the power of the commission to demand. Some think the commission itself may not be willing to carry the question to the courts, and because of the alleged weakness of the case there is also doubt expressed whether or not the Department of Justice will be willing to proceed with it.

That the assets of the Electric Bond & Share Company increased from $4,440,599.40 in 1905 to $124,195,442.63 at the end of 1927 was brought out during the examination of Samuel Meisels, one of the commission's accountant-examiners, at the hearing on Oct. 30. At this hearing Judge Robert E. Healy, the commission's chief counsel, examined several members of the commission's staff who have been at work in the offices of the Bond & Share company. Smith W. Brookhart, Jr., identified the list of the company's stockholders holding voting stock in the Bond & Share Company, the Electric Bond & Share Securities Corporation or in some of the affiliated companies.

Comparative balance sheets were made a part of the record, showing that the company's original capital was $4,000,000 and that it now has outstanding $50,000,000 of preferred stock and $50,000,000 of common stock. Questions by Judge Healy brought out that commissions on the sale of stocks and bonds for affiliated companies grew from $32,487 in 1905 to $3,135,000 in 1926. Much attention was given profits growing out of engineering, construction and other supervisory activities. The testimony showed the profit from those activities to have been $29,279 in 1909 and to have grown to $8,084,956 in 1927.

Judge Healy also inquired into a transaction in 1905 involving the transfer of securities by Lucien W. de Buys, who purchased from the Electric Bond & Share Company securities of several companies. These shares were sold on the day of purchase to the Electric Power & Light Company, a subsidiary formed for that purpose. Mr. Meisels estimated that the profit accruing from that sale alone was $4,500,000.

On Oct. 31 A. R. Colbert of the economic division of the Federal Trade Commission identified and explained further exhibits dealing with the receipts of the Electric Bond & Share Company. A statement was submitted showing the constructive fees from 39 subsidiaries of the Phoenix Utilities Company and eight subsidiaries of the Texas Construction Company. These grew from a total of $87 in 1918 to $1,364,455 in 1927. The account covering commissions on stocks and bonds was analyzed and found to consist of commissions on preferred-stock campaigns, profits on sales of bonds, notes and stocks, and commissions received from Electric Investors, Incorporated, on purchases and sales of securities for the account of this subsidiary. The total under these headings was $1,288,216 in 1927.

Records of subsidiary companies covering the same three items have been requested from the Bond & Share company and will be submitted when received. No hearing is contemplated next week on account of the elections, but it is expected that the proceedings will be resumed on the week following.

A published statement to the effect that the Federal Trade Commission had requested an appropriation of $250,000 to continue its public utility investigation could not be confirmed either at the commission's offices or at the Bureau of the Budget.

Group Meeting of Southeastern Division, N.E.L.A.

The Southeastern Division of the National Electric Light Association held a group meeting of the committees of the Commercial, Accounting and Public Relations Sections on Oct. 25 and 26 at the Hotel Biltmore, Atlanta. Charles A. Collier, vice-president of the Georgia Power Company, as president of the division was in charge of the meeting.

The afternoon of the first day was given over to a joint meeting of all committees, which was enlivened by a discussion of the possible effects that a more stringent collection policy would have on the public relations of a utility company. Charles R. Preston, sales manager Florida Power & Light Company, outlined the plan that is being followed by his company with much success in the educating of employees in the basic principles of its business and policies.

The four bureaus devoted to power, cooking and heating, wiring and merchandising each outlined plans and undertakings, industrial heating, water heating, house wiring and selling campaigns being the respective keynotes.

The women's committee of the Public Relations Section adopted plans for a public speaking contest to be held in the women's committees of the member companies with company prizes offered by individual companies and the state prizes by the executive committee of the division. In the accounting sessions there was considerable discussion by the customer records committee about "painless methods of collection" and by the purchasing and storeroom committee on methods for disposing of obsolete and overstocked materials.

Growth of the N.E.M.A.

Sixty-seven Companies Added to Roster in One Year—Crouse, Raycroft, Allen and Bussman Address Session at Briarcliff, N. Y.

MORE than three hundred electrical manufacturers attended the National Electrical Manufacturers' Association convention at Briarcliff, N. Y., Oct. 28-Nov. 1. The several divisions met in separate closed meetings to discuss their manufacturing problems, and at a general session held on Tuesday several outstanding interesting topics were presented and discussed.

Picturing the rapid growth of the association, President Huntington B. Crouse pointed out that the increase in the number of companies represented, from 283 to 350 within a year, coupled with prospective business and activities, has resulted in a definitely greater development of the industry and better service to the public.

The radio industry was warned by L. B. F. Raycroft, vice-president in charge of the Radio Division, not to encourage reports and exhibits tending to exaggerate the present practicability of television in commerce and entertainment.

The subject of an adequate tariff for electrical products was presented by Thomas Allen, chairman of N.E.M.A. tariff committee. He urged electrical manufacturers to study production costs here and abroad with a view to supporting any requirements that may be made for greater production founded on American production-cost valuation.

Harry T. Bussman outlined terms of payment in the electrical industry as revealed by an 86 per cent return of a questionnaire to the industry.

A.I.E.E. Atlanta Meeting

The Southeast regional meeting of the American Institute of Electrical Engineers held at Atlanta on Monday, Tuesday and Wednesday of this week and devoted mainly to power development, power-system operation, communication and textile operation attracted a good attendance and drew forth excellent papers. The Electrical World's report will appear next week.

New Orleans Host to Two Electrical Conventions

International Association of Municipal Electricians and Southern Section of International Association of Electrical Inspectors Meet in Crescent City

DISCUSSIONS on street lighting, airway lighting, traffic regulations, electrical inspection, uniform wiring ordinances, police and fire alarm systems, electrolysis and other subjects of general interest to the industry featured the thirty-third annual convention of the International Association of Municipal Electricians at the Monteleone Hotel, New Orleans, Oct. 23-26. The meeting of the International Association of Electrical Inspectors, Southern Section, was held in the auditorium of the New Orleans Public Service, Inc., on Oct. 22.

William M. C. Runyon, representing the Crouse-Hinds Company, Syracuse, N. Y., pointed to the advantages of the 1928 National Electrical Code and said that industrial plants grounded with safety circuits in compliance with that code are doubly guarded against fire damage and injuries to employees. He expressed the opinion that perfection is being approached through the co-operation of federal experts, municipal electricians, inspectors and other agencies.

Mel Morris of Tampa, Fla., said that in the near future the same safety reached through improvements in railroad signaling systems will be offered on airways. Pointing to the flights of Lindbergh, Byrd and Chamberlain, he declared that engine failure and the wide span of the ocean are not the great hazards in transatlantic flying. "With improved aviation motors and the ability of planes to stay in the air for long periods of time," Mr. Morris said, "the greatest hazard is in landing. When airways are lighted so as to be visible through rain and fog and airports are flooded with light to make them fully visible to pilots, the greatest danger in aviation will be removed."

F. W. Mackail of Syracuse, N. Y., and F. H. Winkley of Schenectady, N. Y., contributed to the discussion of problems confronting electricians and electrical engineers in making the air passage safer.

At the meeting of the electrical inspectors Victor H. Tousley, field secretary of the National Fire Protection Association, spoke of the responsibility of electrical inspectors to the public. A principal function of the International Association of Electrical Inspectors is to teach its members how to save lives and property and how best to discharge their obligations to the public and to themselves, he said.

At the same meeting C. J. Peacock, New York, field engineer for the Underwriter's Laboratories, said that an organization of electrical inspectors can render great help to the electrical inspectors themselves, to the underwriters and ultimately to the public.

Boston was selected as the next meeting place of the International Association of Municipal Electricians, and C. K. Ahern, Waterbury, Conn., was elected president. Vice-presidents elected are G. P. Allen, Jacksonville, Fla.; B. C. Haldeman, Kansas City; C. J. Reading, Salt Lake City, and C. S. Downs, Altoona, Pa. Walter Dilzell, New Orleans, and H. N. Lang, Orlando, Fla., were elected treasurer and secretary respectively.

Officers elected by the International Association of Electrical Inspectors, Southern Section, are: President, N. E. Cannady, Raleigh, N. C.; first vice-president, L. T. Rogers, Shreveport, La.; second vice-president, H. N. Pye, Atlanta; secretary-treasurer, C. S. Crawford, Gretna, La. Ignoring territorial considerations, Detroit was selected as the next meeting place.

Purchases and Mergers

LIGHTING companies in and near Wilmington, Del., are to be consolidated, it is reported, under the Delaware Light & Power Company. Those named are the Wilmington Light & Power, Wilmington City Electric, Newcastle Electric and the American Power companies. The United Gas Improvement Company controls them as well as the Delaware Electric Power Company, which in turn will own the common stock of the Delaware Power & Light Company.

Although temporarily restrained by court action from making the consolidation effective over the protest of minority stockholders, the majority stockholders of the Augusta-Aiken Railway & Electric Corporation and of the Georgia-Carolina Power Company of Augusta, a property leased and operated by the Augusta-Aiken company, have voted, 36,717 shares to 2,725, to consolidate as the South Carolina Power Company. Merger of both the Augusta companies with the Southeastern Power & Light was noted in the ELECTRICAL WORLD for July 28 (page 181).

The electric distribution system of Norcatur, Kan., has been sold to the Western Light & Power Company of Salina, subject to the approval of the state commission. Norcatur has been receiving its electric power from Oberlin.

Application to the Missouri Public Service Commission seeks permission for Frank Delp and W. L. McDowell to sell the Strafford Electric Light Company to the Electric Utilities Company of Joplin, and for the latter concern to purchase electric properties at Fair Grove from Burt Murrell and J. C. Godwin.

The Charles Frush Light & Power Company of Jesup, Iowa, which for ten years has purchased energy at wholesale from the Iowa Public Service Company, has been sold to the latter, which will assume control Nov. 1.

A court ruling says that the City Council of Woodward, Okla., under the charter form of government, sold the municipal light and power plant of that city when on Aug. 6 it approved calling a special election on the sale of the plant, which resulted on Sept. 14 in granting a franchise to the Western Light & Power Corporation of Salina, Kan., although a 60 per cent majority was not obtained as required by a statute recently passed by the Oklahoma Legislature. The case will probably be appealed to the Supreme Court.

It is reported from Patrick County, Va., that the White Falls Power Company and the Stuart Light & Power Company have sold their plants and good will to the Public Utilities Corporation of Cleveland for a sum not made public. Possession of the properties will be taken on Nov. 15. Power lines will be built to Critz, Patrick Springs, Five Forks, Buffalo Springs and Central Academy.

The municipal electric plant at Brewton, Ala., has been sold for $125,000 to the Alabama Power Company, which will serve that place and also East Brewton, building a transmission line to Brewton from its substation near Flomaton.

The power plant and distribution system of Trenton, Fla., county seat of Gilchrist County, has been purchased by the Florida Power Corporation, which intends to construct a transmission line to connect the community with its lines.

Charging that present power rates are retarding the industrial development of Grays Harbor, the City Council of Aberdeen, Wash., has adopted a report urging immediate steps to acquire the power plant and system of the Grays Harbor Railway & Light Company.

Commercial Meeting at Wausau, Wis.

Wisconsin Utilities Association Section Looks Into Electricity as Substitute for Gas in Commercial Cooking and Considers Other Topics

ADVANTAGES to utility companies of aggressive sales measures and thoroughly trained salesmen were discussed at the annual convention of the Commercial Section of the Wisconsin Utilities Association at Wausau, Oct. 25-26, with an attendance of 145.

C. R. Phenicie, Green Bay, president of the association, speaking on "Our Industry," asserted that until the utility industry shall have presented its own case in the Federal Trade Commission investigation no one can fairly judge the facts.

E. S. Schrank, Oshkosh, chairman of the power committee, reported that, according to a questionnaire sent to all commercial managers of utilities in Wisconsin cities with more than five thousand population, combination gas and electric companies believe in promoting gas sales more than electric sales for commercial cooking purposes—for instance, in hotels, restaurants and bakeries. All but one city had rates for this service between 3 cents and 4 cents a kilowatt-hour. Three answered the question as to the rate required to compete with gas by specifying 2½ cents and preferably 2 cents. While a few managers felt that a 3-cent to 4-cent rate was a little high, all believed that concerted sales effort more than a lower rate was the thing required.

O. J. Kruse, Milwaukee, chairman of the lighting committee, advocated the establishment of a lighting service force for each company to work with architects, builders and customers. He thought that such departments will increase sales and improve good public

relations and he reported that one force of five men increased the sales revenue of a Wisconsin company from $56,650 in 1926 to $105,520 in 1927.

L. M. Williams, Madison, chairman of the electric merchandising committee, urged companies to use chain-store methods and to employ special outside salespeople and special inside sales forces.

G. V. Rork, Owen, chairman of the rural electric service committee, said that rural electrification is now a commercial department problem and must be furthered through modern merchandising methods. He reported that 18,227 farmers in Wisconsin are now being supplied by central-station companies, contrasted with 8,949 in 1925.

Miss Zella Patterson, Green Bay, announced that eight home service departments are being conducted continuously by Wisconsin companies.

Speakers in a symposium on "better advertising" were R. O. Jasperson, W. F. Huels, F. E. Eriksen, and G. V. Vaughan. Mr. Jasperson urged a yearly advertising budget which should include institutional advertising; Mr. Huels favored greater appeal to personal benefit in advertising; Mr. Eriksen urged companies to examine the value of advertising mediums very closely and discounted the use of programs, special editions and donations, and Mr. Vaughan said that money spent in newspapers brought the best results.

E. R. Felber, sales manager Madison Gas & Electric Company, was elected chairman of the section, and F. H. Evans, commercial manager Wisconsin Valley Electric Company, Wausau, vice-chairman.

Governor Smith Again Assails "Power Trust"

Speaking at Baltimore on Monday night, Oct. 29, Governor Smith of New York, Democratic candidate for the Presidency, again assailed the "Power Trust" and criticised the expressions of his opponent, Secretary Hoover, on power control. The Governor incidentally quoted Senator Borah in his support and accorded high praise to Senator Norris. He said on this topic:

Certainly, no progressive, forward-looking citizen of this country, no matter to which political party he may owe his allegiance, is satisfied with the present attitude to the development of our great natural water-power resources.

What is the old order? The old order is private development leases for a long term of years, first come, first served, the fellow on the job quickest gets the most; private development, private operation for private profit and private gain. The new order, which is contained in the Democratic platform and followed by the Democrats and the Progressive Republicans of the country, calls for development by the state or by the nation, with ownership and control of these great water powers in the hands of the people themselves—their rightful owners. While it is true that Mr. Hoover does not definitely say where he stands, nevertheless we are compelled to spell out of the record that he stands upon the old order of things. . . .

What is the hidden force behind the Republican organization and their candidate that drives them into this position, so palpably against public opinion? These things do not happen by accident. A man takes the easiest path naturally. When he takes one that brings great opposition and great forces against him there has got to be some reason. And what is it? Senator Norris disclosed it in his speech of Saturday night. It is nothing more or less than the American power trust, an aggregation of men that have their eyes upon these power sites and are waiting for the opportune moment to take control of them so that the wheels may grind for their benefit.

Unusual Notes Struck at Huntington Convention

West Virginia Association Hears Criticism of Safety in Power Industry and Insistence on Personal Character as Element in Public Relations

REGISTRATION of 294 delegates and an attendance of 450 at the banquet made the eleventh annual meeting of the Public Utilities Association of West Virginia the largest meeting in the history of the association. The convention was held in Huntington Oct. 24 and 25, and the meetings were presided over by the president, Arthur M. Hill of Charleston.

Responsibility to the public, accident prevention in the light and power industry and structural rate making were among the leading subjects, and in dealing with them some notes a little outside the ordinary ones were struck. Several speakers mentioned the power investigations, some warning that efforts to convince the public of the straightforward methods that have been followed generally in the industry must be continued, while others advised that the investigations be forgotten and efforts be concentrated on the big job of merchandising power.

At a group luncheon of the Light and Power Section, held the first day, H. N. Muller described outdoor Christmas lighting.

"If we conduct these utilities as we should, there will be no demand for government ownership, but if we don't, it will be difficult to prevent it," said G. M. Alexander, president of the Monongahela-West Penn Public Service Company. He declared that among requirements not always recognized are "honesty, absolute and scrupulous, not merely legal honesty"; truthfulness, prompt fulfillment of promises, private life of officials in keeping at least with the average moral standards of the community, and the company setting an example as a good citizen. Because the public has granted the franchise to operate and is in many instances a part owner, it has the "right to expect that that officials be men of proper conduct."

C. I. Weaver of Springfield, Ohio, vice-president of the Ohio Edison Company and representing the National Electric Light Association, speaking on "Man Power," explained how by research, better management and public contact, all demanding "bigger and better man power," the utilities will gain.

Comparisons with the steel industry were made by Fred A. Lange, Ohio Department of Safety, Columbus, who, speaking on "Public Utility Safety," criticised the light and power industry for failure to cut the accident rate. In Ohio, he said, the average among light and power companies for 1927 was 48 accidents per million man-hours, which is about the same as for some years past. As compared with this, the Lorain Steel Company has completed three million man-hours without an accident, and yet "the iron and steel industry is essentially more hazardous than the electric light industry. First aid is splendid," Mr. Lange declared, "but it is not accident prevention."

N. M. Argabrite, vice-president of the American Gas & Electric Company, discussed structural rate making, showing by well-chosen figures, some actual and others assumed, that the sum of the readiness-to-serve and per-customer charges can be on the order of ten times the actual manufacturing cost. This, Mr. Argabrite held, proved that "we are not selling a commodity, but are absolutely selling a service." He showed why energy can be sold to one customer for 1 cent at a profit and to another customer for 10 cents only at a loss. "If I had to discard anything in a rate I would discard the cost of manufacture," the speaker declared. Unfortunately, the small customer is not ready for the proper type of rate.

A part of the last session was given over to a program by the women's committee. Speakers were Margaret Schneider, Wheeling Elecrtic Company; Esther Rockey, chairman women's committee, East Central Division, N.E.L.A., and Mrs. Louella Fisher, national chairman home service committee, American Gas Association.

Officers elected are: President, A. C. Spurr, general manager Wheeling Traction Company; vice-presidents, W. F. Ficklen, manager Appalachian Electric Power Company, Charleston; C. H. Hardesty, assistant to president, Monongahela-West Penn Public Service Company, and Fred M. Hawley, treasurer Bluefield Telephone Company; executive secretary, A. Bliss McCrum, Charleston; treasurer, G. B. Moir, Charleston.

American Standards Association Succeeds A.E.S.C.

On Nov. 1 the American Engineering Standards Committee passed out of existence and gave way to the American Standards Association in accordance with the plan noted at length in the ELECTRICAL WORLD for July 14 (page 81) and voted upon by the member bodies, which were unanimously in its favor. The new body will not formulate standards, but will provide systematic means by which units in industry, when they find it necessary to set up standards, may come together for the purpose of formulating them.

Great Lakes Engineers Wide Awake

Inductive Co-ordination Has Broad Treatment at Jackson Meeting —F. F. Fowle Criticises Codes—Lightning Investigations Recounted—Worth-While Committee Discussions

RAPIDLY growing capacities and voltages of transmission lines and the coincident developments in communication in the way of greater sensitivity and complexity combine to make the problem of inductive co-ordination an increasingly important one. This was the principal impression carried away from the meeting of the Engineering Section, Great Lakes Division, N.E.L.A., at Jackson, Mich., Oct. 24-27, by the two hundred and more engineers who attended. But they got more than this one idea from the committee meetings and from the inspection trips and entertainment arranged for and provided by their hosts, the Consumers Power Company and the Commonwealth Power Corporation of Michigan.

Inductive Co-ordination to the Fore

The feature of the four-day meeting was an open joint session of the inductive co-ordination and overhead systems committees. This session was opened with an address by E. C. Stone, chairman of the Engineering National Section, who enlarged upon the duties of the engineer as a scientific business man. He advised his auditors to lay aside the characteristic and sometimes impolitic positivity of the engineering mind and to regard the problems confronting them from a business point of view as well as from the strictly physical angle. More and more the development of the electrical and all other industries demands the complementary efforts of science and business; either one alone is incapable of the job, and the man who makes a worth-while contribution to progress must be able to understand and combine the two.

Following Mr. Stone, Frank F. Fowle spoke on "Present and Future Types of Line Construction." Electric utility regulation, said Mr. Fowle, affects the physical arrangement and design of systems as well as service, rates and financing. This regulation takes the form of codes for construction looking to the elimination of life and property hazards. It is the duty of the electric utilities to interest themselves actively in the development and formulation of such codes if they are not to find, at no distant time, that they are enmeshed by rules and requirements of onerous and uneconomical nature. Even now most safety codes are on a wholly empirical basis, principally because the utilities, so much affected by these codes, have not made adequate effort to insure their correctness. Ambiguities and inconsistencies of the recently promulgated code were quoted by Mr. Fowle to bear out his contentions. Another thing the speaker emphasized was the necessity that national rules should include provisions of adaptation to local conditions, it being impossible, for instance, to set up regulations in regard to ice and wind loadings applicable to all parts of the country. Mr. Fowle's address was followed by much discussion on design and construction of overhead systems in the Great Lakes region.

Development and Research

In preface to the paper by H. L. Wills on the "Development and Research Program of the Inductive Co-ordination Committee," J. C. Martin, who preceded Mr. Wills as chairman of that national committee, presented a very interesting history of the development of the art. Mr. Martin asserted that the problem of co-ordination would exist and expand so long as the electric utility and communication industries continued to grow. The phenomenon of electromagnetic induction is one of the foundation stones of both industries, and both should cooperate to minimize its bothersome effects. In his absence, Mr. Wills' paper was read by G. J. Hemstreet.

This paper attracted and held the interest of those present because, as was remarked by E. C. Stone in commenting on it, it brought to their attention a condition and an art of which the average engineer knows little. According to Mr. Wills' paper, co-operation between the National Electric Light Association and the Bell Telephone System has brought about a mutually acceptable code of principles on which the problems of interference can be worked out. To a joint development and research sub-committee has been assigned the obtaining of data for the compilation of practices to be used as working tools in the solutions of interference problems in the field. A series of eleven projects involving investigations of both telephone and electric utility methods, designs and conditions are now in hand.

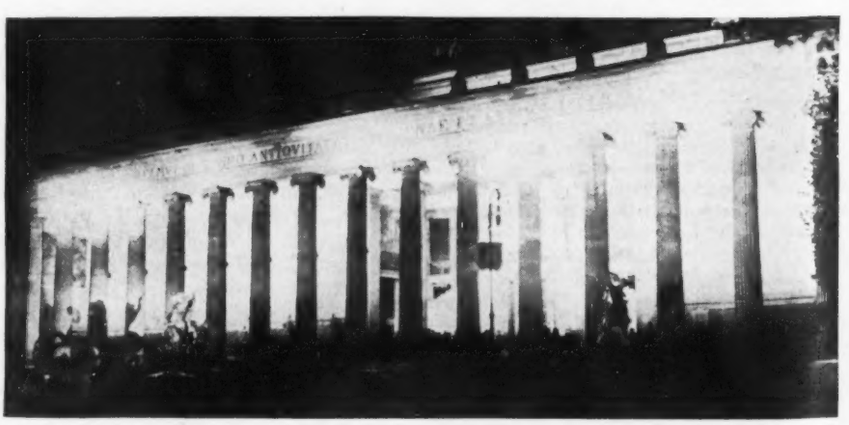
The combination of a live subject and an engaging manner enabled E. S. Lee to hold the close attention of his audience while he spoke on the status of lightning investigations. He recounted the many difficulties in the way of field research on lightning and prophesied that soon it would be possible to bring field and laboratory methods together through the construction of artificial lightning generators and their direct use on actual lines under actual system conditions. He reviewed the data on lightning behavior that so far have been established, at a cost, he estimated, of one-half million dollars. Recent improvements in instruments for lightning study, notably of the cathode-ray oscillograph, hold out hope that much will be accomplished along this line in the near future.

Earnest Committee Discussions

The sessions of committees during the meeting were well attended and were marked by active discussion and comment. Some "high points" at least should be mentioned. Probably most important was the consideration by the hydraulic power committee of regulation of small water-power units. At this session, to which the members of the electrical apparatus committee were invited, a tentative general conclusion was reached that small units operating in large-capacity systems should not have water governors but should be carried along or dropped according to control devices in the electrical system.

Features of the meetings of the underground systems committee were able expositions of practices and methods of the Commonwealth Edison Company, of the installation of 24,000-volt aërial cable by the Detroit Edison Company and of the use of non-metallic sheathed cable for street-lighting circuits. Among its other activities the electrical apparatus committee is engaged in the preparation of a map of systems in the Great Lakes region to show phase relations at possible interconnection points.

Berlin Challenges Paris as Center of Light



PERHAPS with some idea of wresting the title of "La Ville Lumière" from Paris, a "week of light" was recently proclaimed in Berlin. All prominent public and private buildings, squares and streets were brightly illuminated during this period by powerful searchlamps, adding a beautifying touch to evening scenes. The photo shows the old Berlin Museum as it appeared.

Briefer News

ANDERSON, IND., GOES AHEAD WITH PLANS TO EXPAND CITY PLANT.—By a unanimous vote the City Council of Anderson, Ind., has overridden the veto of Mayor F. M. Williams and enacted an ordinance to purchase a 10,000-kw. Brown-Boveri turbine for the municipal light plant there. (See ELECTRICAL WORLD for Oct. 13, page 757.)

NEW UNIT AT HIGHBRIDGE STATION, ST. PAUL, GOES ON THE LINE.—Installation of the new 35,000-kw. steam-electric turbine at the High Bridge station of the Northern States Power Company in St. Paul, to replace the unit damaged early in January, scheduled for Nov. 1, was completed and the unit placed in service on Oct. 18, two weeks ahead of schedule.

ENGINEERING FOUNDATION LAUNCHES DRIVE FOR $7,000,000.—A drive by the Engineering Foundation to raise $7,000,000 has been sanctioned, following a dinner of the organization at which Chairman L. B. Stillwell made a plea for funds. Of the total sum to be raised, $2,000,000 is sought to advance scientific research under the auspices of the foundation and the rest to add to the library in the Engineering Societies Building.

PUGET SOUND POWER & LIGHT COMPANY'S COMING STEAM PLANT.—The steam-electric plant to be built by the Puget Sound Power & Light Company at Renton, Wash., on the shore of Lake Washington, has already got under way. W. D. Shannon, superintendent of construction for the Stone & Webster Construction Company, is quoted as saying that the plant will ultimately have a capacity of 225,000 kw.—one of the largest in the Pacific Northwest.

URBANA, OHIO, DALLIES WITH MUNICIPAL PLANT IDEA.—Petitions are being circulated in Urbana, Ohio, asking the City Council to build and operate a municipal light and power plant. A representative of the Fairbanks-Morse Engine Company has informed the Council that a plant for Urbana could be provided at a cost to the city of $325,000, the money to be raised by the sale of first mortgage bonds on the property. Urbana is now served by the Ohio Edison Company.

PUBLIC SERVICE ELECTRIC & GAS COMPANY OPENS UNION CITY SUBSTATION.—A public reception to stockholders and customers marked the opening of the Public Service Electric & Gas Company's new substation at Union City, N. J., on Oct. 30 and 31. The equipment consists of two 4,000-kw. transformer banks, and the substation, which cost approximately $300,000, will supply the electric light and power needs of the township of North Bergen as well as Union City, drawing its energy from the Kearny, Essex and Marion generating stations and being also connected with the Hudson switching station and with the Seventh Street substation in West New York. The building is on the side of a hill and has been constructed to give a terraced effect.

CALIFORNIA TOWN TURNS FROM GAS TO ELECTRICITY.—The Napa Valley Electric Company has applied to the California Railroad Commission for permission to abandon its domestic gas service in St. Helena. The application declares that out of 122 consumers 62 per cent have agreed to substitute electrical appliances for gas appliances and that the company has proposed to supply electrical equipment to those discontinuing service at a special price. The company alleges that the present gas plant is losing money.

FIFTH UNIT AT BROOKLYN EDISON'S HUDSON AVENUE STATION GOES ON THE LINES.—With the completed installation of a 110,000-kw. Westinghouse turbo-generator in its Hudson Avenue generating station, the Brooklyn Edison Company claims to possess the largest unit of its kind now in operation. The new Brooklyn Edison unit is the fifth to be installed in the Hudson Avenue station. When the station is complete the company will have eight units with an aggregate capacity probably not far from 750,000 kw. Its present rating with the new machine is 340,000 kw.

HYDRO COMMISSION VISIONS GREAT FUTURE-DAY DEVELOPMENT. — The Hydro-Electric Power Commission of Ontario is credited with ambition to divert the Albany River from its course into James Bay and bring it south to Lake Superior by way of the Ogaki River and Lake Nipigon. This Albany River-Lake Superior diversion aims, it is said, at restoring to the Great Lakes the levels lost because of the Chicago Drainage Canal and at new power developments for the industrial centers of the northern half of the province. The cost of the project, involving half a dozen dams, would be tremendous.

TRI-COUNTY WATER POWER AND IRRIGATION PLAN IN NEBRASKA AGAIN AGITATED. — The Hastings (Neb.) Chamber of Commerce is preparing to renew before the Nebraska Legislature the fight to obtain state aid for the development of the Tri-County combination water-power and irrigation development. In resolutions recently passed it urges that by the time the lands affected could be brought into irrigation the farmer will not be faced by any overproduction and will be able to use profitably a part of the power developed.

TIDAL POWER AND THE FISHING INDUSTRY.—At a meeting of the North American Committee on Fishery Investigation held in Montreal on Oct. 23 prominent consideration was given to the damage which might result to fisheries from the harnessing of the tides of the Bay of Fundy at St. Andrews, New Brunswick. It was declared that the Dexter Cooper power project, which proposes to dam Passamaquoddy Bay, on the international coast, with an area of 135 square miles, threatens what is perhaps the most productive sardine-herring fishery in the world.

NEW TRANSMISSION LINES PLANNED FOR THE PHILIPPINES. — The Manila Electric Company is planning to build two 60,000-volt transmission lines north and south of Manila, Philippine Islands. The northern line will pass through a number of municipalities and suburbs and loop back to the city. The southern line will parallel the Manila Railroad from Pasig to Lalamaba, where it will branch to Lucena and Batanga. Some smaller branches are also proposed, but the plans are contingent upon action of municipal boards and the Philippine Legislature.

SAN DIEGO COMPANY PURCHASES SUBSTATION.—Through the purchase of the 5,000-kw. frequency-changer station at San Juan Capistrano, Calif., from the Southern California Edison Company and the establishment of a district office at that point, the San Diego Consolidated Gas & Electric Company will be better able to serve this fast-growing community, lying to the northern end of its territory. The company's generating capacity will be augmented on Nov. 15 by 28,000 kw. when a new steam unit is placed in operation in San Diego.

CLIMBING MONKEY PUTS OUT LIGHTS IN WICHITA FALLS.—A snake, a rat, an airplane and a freak lightning bolt which blew a pole out of its setting without injuring it are reported by Texas Power & Light Company recorders as responsible respectively for various recent short circuits on its transmission lines or those of its subsidiaries. A more novel cause was operative on the system of the Texas Electric Service

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

National Electrical Wholesalers' Association—Chicago, Nov. 12-16. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners — New Orleans, Nov. 13-16. J. B. Walker, 270 Madison Ave., New York.

International Conference on Bituminous Coal—Carnegie Institute of Technology, Pittsburgh, Nov. 19-24. S. B. Ely, Carnegie Institute, Pittsburgh.

Public Utilities Association of Virginia—Hotel Roanoke, Roanoke, Va., Nov. 21-22. A. B. Tunis, 301 East Grace St., Richmond, Va.

Electrical Credit Association—Central Division, Palmer House, Chicago, Nov. 22-23; F. P. Vose, 1008 Marquette Bldg., Chicago. New York Division, New York, Dec. 17; W. J. Kreger, 261 Broadway, New York.

Company at Wichita Falls recently. At this place a small stray monkey wandered into the generating plant, climbed a switch structure and caught hold of a pipe carrying 11,000 volts. The outage was of very short duration, but the indisposition of the monkey lasted some time, seared feet and loss of hair being the most conspicuous symptoms.

CHICAGO "TRIBUNE" INSTALLS UNIQUE ELECTRIC SIGN.—A new idea in electric sign advertising is embodied in a row of numerals extending down the south side of the Tribune Tower Building, Chicago, from the nineteenth floor to the fourteenth. These figures show the daily circulation of the newspaper. The sign is 86 ft. in height and 3 ft. in width, and each of the huge numerals extends the length of a story of the building. The figures will be changed from time to time as the circulation increases, and now and then the Sunday circulation will also be announced in this way.

TABLE ROCK DAM APPROVED.—The Missouri Public Service Commission on Oct. 25 announced that authority to construct the projected dam and hydro-electric power plant on the White River at Table Rock has been granted to the Empire District Electric Company. The proposed dam, referred to last week, which will be 6½ miles from Branson, will be 1,924 ft. in length and 197 ft. high. The Empire District Electric Company is a subsidiary of the H. L. Doherty interests. The dam and plant will be constructed by the company's own forces. The total cost of the project is now put at $16,700,000.

VIRGINIA UTILITIES ASSOCIATION TO HAVE TWO-DAY MEETING IN ROANOKE.—Speakers already announced by President J. W. Hancock for the two-day convention of the Public Utilities Association of Virginia, which will open in Roanoke on Nov. 21, include Henry R. Hayes, vice-president Stone & Webster and Blodget; N. M. Argabrite, vice-president American Gas & Electric Company; William Meade Fletcher, member State Corporation Commission, Richmond; J. P. Fishburn, president State Chamber of Commerce; Floyd W. King, vice-president Virginia Public Service Company, Charlottesville; Tom P. Walker, vice-president Virginia Electric & Power Company, Norfolk, and William E. Carson, chairman of the State Conservation and Development Commission.

HIGH-TENSION LINE FROM LYONS TO SODUS, N. Y.—Construction of a high-voltage 60-cycle power line from one of its central New York plants into the Lake Ontario region, thus assuring constant power to territory lying between Lyons and Sodus, is announced as part of the initial plans of the E. L. Phillips interests following their purchase of the Lake Ontario Power Corporation from the Mills Brothers of Sodus three weeks ago. The new line will bring a long-needed emergency service to the territory and attract new industrial establishments. The plants already draw from the Lake Ontario Power Corporation plant at Sodus and the Northern Wayne Electric Light & Power Company, also controlled by the Phillips interests. The value of the Sodus properties has been placed at $3,000,000, but no purchase price has been announced. Among the towns to benefit by the proposed high-voltage line will be Webster, Williamson, Sodus and Victor.

PITTSBURGH'S NEW GENERATING STATION TO BE NAMED FOR JAMES H. REED.—Ground was broken on Tuesday this week for the new 60,000-kw. steam-electric generating plant on Brunot Island, Pittsburgh, of the Duquesne Light Company, in the presence of officials of the Philadelphia Company and representatives of Pittsburgh's City Council. The structure is to be known as the James H. Reed power station, being named for the late Judge Reed, who organized the public utilities of Pittsburgh which are today grouped under the Philadelphia Company and who served for twenty years as president of the corporation, retiring from that office in 1919. The station was described in the ELECTRICAL WORLD for Oct. 6 (page 701.)

NEW WHITE STAR LINER TO BE DRIVEN BY ELECTRICITY.—Electricity developed either by means of turbine-driven dynamos or dynamos driven by internal-combustion engines will furnish the propulsive force for the new White Star Line steamship now being built in the Harland & Wolff shipyard at Belfast. This is announced by Lord Kylsant, chairman of the White Star Line, who is in the United States for the first time in 25 years. Lord Kylsant mentioned that the application of electricity for driving large vessels, which was first introduced in a large way in the United States Navy, has been so successful as to lead the International Mercantile Marine Company to order its third ship with this form of propulsion as a result of the satisfactory performance of its first turbo-electric liner, the *California*.

PROMOTERS OF NEW RIVER PROJECT ASK AUTHORIZATION OF WEST VIRGINIA COMMISSION.—Application for authority to construct a dam and hydro-electric plant on the New River at New Richmond (Sandstone Falls), W. Va., has been made to the Public Service Commission of that state by the West Virginia Hydro-Electric Company of Charlottesville, Va., a subsidiary of the Virginia Public Service Company. Objections were filed on behalf of the New Kanawha Power Company and the Electro-Metallurgical Company of Glen Ferris, a subsidiary of the Union Carbide Company. The Sandstone Falls project, according to the application filed, will consist of a concrete dam and power house on the left bank of the river. The principal function of the dam will be to "even up the natural crest of the falls and divert the water to the intake at the power house." The petition says that 5,680 primary horsepower would be generated. The company has an application also before the Federal Power Commission.

MONTANA POWER COMPANY TO BUILD A FOURTH PLANT ON THE MISSOURI.—Plans for the immediate construction of a fourth hydro-electric plant on the Missouri River about 14 miles north of Great Falls, to cost more than $4,000,000, have been announced by Frank M. Kerr, vice-president and general manager of the Montana Power Company. The Great Falls Power Company, a subsidiary, will build the plant, which will be known as the Morony development. It will produce 70,000 hp., with a dam about 900 ft. long and 90 ft. high. A completely equipped camp will be built for one thousand men, and the company purposes to complete the project, its tenth major hydro-electric plant, by January, 1930. It will increase the total output of the company from 245,000 kw. to 298,000 kw. The present transmission system covers about 2,400 miles.

TEST OF "WIRED RADIO" PLANNED IN CLEVELAND.—An order has been placed by the North American Company for power-generating equipment for its subsidiary, Wired Radio, Inc., to be used in connection with experimental tests of a "wired-wireless" installation at Cleveland early next year. Test broadcasting will take place over some of the house-wiring lines of the Cleveland Electric Illuminating Company, a North American subsidiary, to determine the quality and capacity of this type of broadcasting. The type of receiving apparatus to be used will permit the same sets to be used to receive broadcasting programs over wires or from the air, it is understood. It is planned to test the transmission of entertainment programs from New York City to Cleveland.

GREEN MOUNTAIN POWER CORPORATION'S PLANS.—Comprehensive plans are being worked out for the future development of hydro-electric power sites in the Vermont territory served by the Green Mountain Power Corporation, a subsidiary of the People's Light & Power Corporation, according to President E. C. Deal. Two small existing power plants and sites in that territory have been purchased; a new 5,000-hp. hydro plant at Middlesex will be in operation early in 1929, and engineers are engaged on surveys and plans for another hydro-electric project to be started next year. The Green Mountain Power Corporation supplies energy to Montpelier, Burlington, Winooski, Barre, Waterbury, Vergennes and other communities. It represents the consolidation of the Burlington Light & Power Company, the People's Hydro-Electric Vermont Corporation and the Eastern Vermont Public Service Company and controls nearly all the output on the Winooski River and its tributaries.

Lee De Forest Wins Out

After Much Litigation United States Supreme Court Affirms His Rights in Radio Patent Disputed by Westinghouse Company and Others

A DECISION of interest in the radio world, involving the so-called "feed-back circuit" cases, in which Lee De Forest and his associates won a victory in a controversy with Edwin H. Armstrong and the Westinghouse interests, was handed down on Monday of this week by the United States Supreme Court.

In a decision without opinion the Supreme Court upheld the judgments of the Circuit Court of Appeals of the Third Circuit and of the Court of Appeals of the District of Columbia. The question at issue had to do with the priority of invention of the "feed-back circuit" through which the modern radio receiver, by amplification of radio signals, has been made effective. Priority of invention was claimed in behalf of Armstrong as against De Forest.

The two cases disposed of were Westinghouse Electric & Manufacturing Company vs. De Forest Radio Telephone & Telegraph Company, and Westinghouse Electric & Manufacturing Company and Edwin H. Armstrong vs. United States of America and Alexder Meissner, General Electric Company and Irving Langmuir, De Forest Radio Telephone & Telegraph Company, Lee De Forest and American Telephone & Telegraph Company.

Charles E. Hughes appeared as counsel for the respondents. The record, as summarized by the New York *Times*, disclosed that Meissner and Langmuir, as well as Armstrong and De Forest, applied for patents for similar equipment designed to perfect the "feed-back circuit." De Forest devised what was described as a "feed-back oscillator" and Armstrong a "feed-back amplifier." Armstrong also invented a "feed-back oscillator" and proceeded against De Forest for infringement, alleging that his patent "was a basic patent upon the feed-back circuit whether employed as an amplifier or as an oscillator."

Armstrong won his case in the federal court in New York and in the Second Circuit. De Forest was the victor in the District of Columbia Court of Appeals and in a cause tried in Philadelphia. This week's decision hinged on the Philadelphia trial and upheld the judgment of the lower court for De Forest. The judgment given in New York and the Second Circuit was not passed upon. It still stands, but probably will be modified to conform to the Supreme Court's decision.

Cambridge Rate Case Comes Before Master

Sitting as master in the United States Court at Boston, Chief Justice Scott Wilson of the Maine Supreme Court opened hearings Oct. 24 in the case of the Cambridge Electric Light Company vs. the Massachusetts Department of Public Utilities. The company seeks an order restraining the commission from enforcing its finding of last January by which it reduced the company's maximum lighting rate from 8 cents per kilowatt-hour to 5½ cents. R. G. Dodge, chief counsel for the company, contended that the order of the board is confiscatory and declared that the company should be permitted to earn a minimum return of 8 per cent upon a rate base of $8,000,000. The commission fixed the rate base at $5,500,000 and asserted that the 5½-cent rate would enable the company to earn $345,000, or slightly more than 6 per cent on the latter valuation.

At the time the board's decision was handed down the commission offered the company an alternative rate composed of a service charge of 50 cents per month and an energy charge of 4 cents. Mr. Dodge announced that he would show that the company's net earnings for the year ended June 30, 1928, on the basis of the 5½-cent rate were utterly inadequate to yield a fair return on the reproduction cost of the property less depreciation. He also said that the proposed alternative rate was out of the possibility of acceptance by the company as it would yield $50,000 less per year than the 5½-cent rate without a service charge.

Lothrop Withington of counsel for the State of Massachusetts declared that the commission does not consider so-called prudent investment the only test of rate base. The commission was influenced in its finding by the acquisition of the Cambridge company by the Associated Gas & Electric Company and held that the company's needs *per se* would be covered by the rate which it imposed.

Decision Against Utility Use of Augmented Canal Flow

New York State has been successful in its fight to protect its rights in the increased flow of water caused by the enlargement of the state canal system at Lockport so far as the decision made by Frank H. Hiscock, former Chief Justice of the Court of Appeals, sitting as referee, is concerned. The decision holds that under a century-old lease the Hydraulic Race Company of Lockport, one of the Niagara Falls Power Company group, is entitled to the use of only that amount of water from the canal at Lockport which would have been surplus at the time the lease was made. The Hydraulic Race Company contended that the 1826 lease was so broad that the company had a right to all surplus canal waters at Lockport regardless of how greatly the canal might have been enlarged. The further claim was made that state officials had by implication recognized the company's rights in permitting the company to use for a long period of years the added flow of water created by the canal enlargement in 1874 and the construction of the Barge Canal. This amounted to approximately 1,000 sec.-ft. of water.

Commission Rulings

CALIFORNIA COMMISSION REITERATES ITS CONCEPTION OF BASE FOR RATES.—In evaluating the Smith River Power Company's properties for rate-making purposes, the California Railroad Commission repeated the principles that govern it in such procedure. It said: "The commission has heretofore gone on record that it will not permit the issue of securities against an allowance for going-concern value; likewise that the security issue should be based upon the estimated historical cost of the properties, consideration being given to the depreciation of such properties and the earnings realized from their operation."

ALLOWANCE FOR GOING VALUE REFUSED.—In valuation proceedings affecting the Union Electric Company of Dillon, the Montana Railroad and Public Service Commission conducted a thorough research into established practice affecting going value, as a result of which it observed: "We believe that where a utility property is valued on the basis of reproduction cost new less depreciation and the items of organization expenses, etc., are taken into consideration and included in a general allowance for overheads, and the subsequent business development costs are paid out of operating expenses, no additional sum should be allowed."

Recent Court Decisions

FILING OF CONTRACT FOR POWER WITH COMMISSION AND ITS APPROVAL BY LATTER PREREQUISITE OF SUIT FOR BREACH IN OHIO.—Since the Marion Steam Shovel Company failed to prove that it had filed with the Ohio Public Utilities Commission a contract by which the Columbus, Delaware & Marion Electric Company was to supply the industrial company with power and that the commission had approved such contract, the Court of Appeals of Ohio dismissed a suit for breach of contract. (162 N.E. 725.)*

NEGLIGENCE NOT INHERENT IN FOREMAN'S INSTRUCTIONS TO LINEMEN TO WALK ON TRACKS DURING SNOWSTORM.—Damages were awarded to the plaintiff in Reed vs. Davis and New York Central Railroad because of the death of a telegraph lineman who was struck by a train while walking on the railroad's tracks to work during a heavy snowstorm which had piled up the snow in drifts on each side of the track. The Court of Appeals of New York remanded the case, saying that as the men were accustomed to go to work by traveling on the tracks in a motor car, the mere fact that the foreman on this occasion directed or suggested that they walk in the snowstorm without trying to use the car did not constitute negligence. What the jury should determine was whether the railroad had rules for the protection of workmen in such cases, whether such rules were feasible and whether they had been observed. (249 N.Y.S. 34.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

GERARD SWOPE, president of the General Electric Company, arrived in New York Oct. 26 aboard the Cunard liner *Berengaria* after a short trip abroad.

J. WALTER BLAIR, formerly electrical engineer of the Tucson Gas, Electric Light & Power Company, has joined the engineering department of the Arizona Edison Company with headquarters in Phoenix.

L. K. DOUTRICK, formerly connected with the Florida Power & Light Company, at Palm Beach, Fla., is now associated with the Central Arizona Light & Power Company as electrical engineer.

H. U. HART is now vice-president and chief engineer of the Canadian Westinghouse Company. A short biographi-

cal sketch of Mr. Hart was published in the Sept. 29 issue of the ELECTRICAL WORLD.

GILBERT CURTIS has been transferred from the industrial service department of the Blackstone Valley Gas & Electric Company at Pawtucket, R. I., to take charge of commercial and industrial lighting in the Woonsocket division.

LEO N. BLAGOVESCHENSKY was recently appointed assistant general engineer of the Georgia Power Company, Atlanta, Ga. He was formerly connected with the Mexican Light & Power Company, Mexico City.

HUBBARD M. LOUDON has been appointed supervisor of substations in the Rhode Island division of the New England Power Association. He formerly occupied the same position with the Eastern division. Mr. Loudon first engaged in electrical work in Ohio, later removing to Springfield, Vt., where he affiliated himself with a contractor and later with the Vermont Hydro-Electric Corporation until his connection with the New England Power System. In the course of his affiliation with the New England system he has served as substation operator, in the maintenance department and as supervisor of substations in the eastern division.

HARTLEY L. H. SMITH, superintendent of steam power, New England Power Company system, since 1918, and for the previous sixteen years chief of the testing bureau, Brooklyn Rapid Transit Company, has been appointed research engineer of the New England Power Association, with headquarters in Boston, Mass.

LEWIS E. BURLEIGH has been appointed superintendent in charge of the Bristol, Warren, and Barrington territory of the Rhode Island division of the New England Power Association. Mr. Burleigh will have charge of the gas and electric operations of the company and will co-operate with the sales department in merchandise sales, power sales, gas and lighting sales.

EDWARD BLEVINS, formerly assistant chief engineer of the Ponce Electric Company, Ponce, P. R., is now connected with the distribution department of the Tampa Electric Company. Both these companies are controlled by Stone & Webster.

L. L. HILL has been appointed vice-president of the W. B. Foshay Company, Minneapolis, Minn. He has severed his connections with the Page & Hill Company, manufacturer of cedar poles, to undertake his new work in the utility and business activities of the Foshay Company. For more than seventeen years Mr. Hill has been associated with Mr. Foshay more or less intimately and only left the pole business because of the larger opportunities of his new association. He has been a leader in the pole business and his many friends wish him success in the utility and business field represented by the Foshay Company.

FREDERIC NICHOLAS of Goodwin, Nicholas & Morton, market counselors of New York, has just severed his connection with that organization. Mr. Nicholas was connected some few years ago with the editorial staff of the ELECTRICAL WORLD and more recently served as secretary of the Associated Manufacturers of Electrical Supplies.

LESLIE R. HICKS has resigned as chief electrical engineer of Charles H. Tenney & Company, Boston, Mass., to join the staff of the Electric Bond & Share Company as electrical engineer of the South American properties of that organization. He is sailing today for Rio de Janeiro, Brazil, where he will make his headquarters. Mr. Hicks has been with the Tenney organization since 1914 and at the head of its electrical work since 1917. Prior to this connection he was for five years superintendent of the Fall River (Mass.) Electric Light Company.

A. V. R. COE, secretary of the Philadelphia Electric Company, has been elected secretary of the Philadelphia Suburban-Counties Gas & Electric Company, according to an announcement made by William H. Taylor, president, after a meeting of the board of directors. Mr. Coe's connection with the Philadelphia Electric Company dates back to 1898, when he was elected secretary and assistant treasurer of the Pennsylvania Manufacturing, Light & Power Company. When the Philadelphia Electric Company of New Jersey was organized in 1899 he was again elected to those offices, and in 1902, when the present Philadelphia Electric Company was incorporated, he was again elected secretary and assistant treasurer.

GEORGE R. KERR is now vice-president and treasurer of the Canadian Westinghouse Company. A short sketch of Mr.

Kerr's background in the industry was published in the Sept. 29 issue of the ELECTRICAL WORLD.

HENRY G. LAMB, formerly connected with the Boston office of Stone & Webster, Inc., is now affiliated with the engineering department of the Pawtucket division of the Blackstone Valley Gas & Electric Company.

DON M. STERNS will remain as president of the Iowa Public Service Company following the reorganization of that company and its associated companies, the Sioux City Gas & Electric Company and the Sioux City Service Company. L. W. Wade, formerly treasurer, will become vice-president. G. A. Neal, in charge of operation, will remain as vice-president and W. N. Porter, formerly secretary, will assume the duties of secretary and treasurer. R. B. Searing, formerly secretary of the Sioux City company, will become assistant secretary and treasurer of the Iowa Public Service Company in addition to his duties as assistant secretary and treasurer of the Sioux City Gas & Electric Company and the Sioux City Service Company. Mr. Sterns has been elected president of the Sioux City Gas & Electric Company and W. J. Bertke vice-presidnet and general manager of that company.

J. S. Just has resigned as engineer and manager of the City Electric Light Company, Brisbane, Australia, after an association of more than thirteen years. Mr. Just will establish a consulting engineering practice.

Ralph K. Mason, vice-president in charge of sales of the Trumbull-Vanderpoel Electric Manufacturing Company, has resigned as an officer of the company. Mr. Mason's recent illness and the present condition of his health are responsible for this action.

G. A. Gaherty, managing director of the Calgary Power Company, Ltd., Montreal, has been elected president of that company to succeed I. W. Killam, who has become chairman of the board of directors. H. H. Parlee, K. C., has been elected to the directorate.

Atherton Clark of the export department of the Black & Decker Manufacturing Company will start early in November on a year's trip which will include Hawaii, Japan, China, the Philippine Islands, Dutch East Indies, India, Australia and New Zealand, visiting the present distributors of Black & Decker products in these countries and establishing new distributing connections.

John W. Lapham, secretary and manager of the North Central Electric Association with headquarters in Minneapolis, recently returned from a short trip to Europe. His itinerary included the British Isles, Holland, Germany, Switzerland, Italy and France. Mr. Lapham gave special attention during his visit abroad to electrical developments in the field of domestic lighting.

H. C. Lucas, treasurer of the Philadelphia Electric Company, has been appointed treasurer of the Philadelphia Suburban-Counties Gas & Electric Company. Mr. Lucas was purchasing agent of the Pennsylvania Globe Gas Light Company in 1898 and continued in that position when the Philadelphia Electric Company was organized in 1899. Three years later, when the present Philadelphia Electric Company was formed, he held a similar position. It was in 1911 that he was elected treasurer of the Philadelphia Electric Company.

A. G. Gibbony, who for the past seven years has been superintendent of the substation department of the southern division of the Ohio Power Company, with headquarters at Newark, has been appointed superintendent of the Mount Vernon district to succeed the late W. B. Wilkinson. Mr. Gibbony spent six years with Stone & Webster, in Iowa, as electrical superintendent of the Fort Madison Electric Light & Power Company before transferring his interests to Ohio. Prior to this Iowa connection he was for eight years with the Aluminum Company of America, first at Pittsburgh in the engineering department and then at East St. Louis as assistant electrical superintendent. Subsequently he served for six years as superintendent of the Massena Electric Light & Power Company, a property of the Aluminum Company, at Massena, New York. Mr. Gibbony's early experience was in the shops of the Allis-Chalmers Company at Cincinnati and the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa.

J. Gardner Coolidge, 2d, has resigned from the research and instructing staff of the Harvard Graduate School of Business Administration and been elected vice-president of the Montan Treating Company, with headquarters at 141 Milk Street, Boston, Mass. For the past three years Mr. Coolidge has been engaged in public utility work at Harvard and has been identified with a number of important studies of rate problems, investigations of interconnection economics and other electric light and power developments.

L. N. Spears, member of the Chattanooga bar, has been appointed attorney of the Tennessee Electric Power Company, Chattanooga. Mr. Spears will now devote his entire time to the legal affairs of the company. He has been identified with the Tennessee Electric Power Company and its predecessor companies for many years, handling various legal matters incident to the inauguration of construction work on the Hales Bar lock and dam and representing the company during the building of the project. Upon graduation from Cumberland University Law School at Lebanon, Tenn., 25 years ago, he opened law offices at Jasper, Tenn., with his father. Eighteen years ago the two men moved to Chattanooga, where they maintained law offices until recently.

Lowell S. Monroe, formerly advertising manager for the Electric Controller & Manufacturing Company, is now a member of the engineering staff of the Copperweld Steel Company, Glassport, Pa. He will be engineer, in charge of service data. Mr. Monroe's previous experience with not only the Electric Controller organization but also with General Motors particularly fits him to take over the work of developing Copperweld service data on such subjects as sag in overhead ground lines, vibration in bonding wires, endurance in guy wires, resistance of earth grounds, etc., which heretofore has proved of such constructive benefit to technical engineers. Mr. Monroe was graduated in electrical engineering from the University of Michigan, later taking post-graduate work at Ohio State.

Albert M. Boyd, who has been connected with the United Gas Improvement system for more than 27 years, has been appointed manager of the personnel, claims and safety department of the Philadelphia Electric Company and the Philadelphia Suburban-Counties Gas & Electric Company with headquarters in Philadelphia. Following assignments at the Philadelphia Gas Works and at the West Philadelphia and Spring Garden districts he was named superintendent of the Germantown district and served in that capacity until 1922, when he became a member of the general superintendent's staff, where he specialized almost entirely on distribution work. Mr. Boyd is also somewhat familiar with the manufacturing end of the business, having acted as manager or engineer of several of the U.G.I. companies for months at a time.

Obituary

William C. Courtney, a director of the Brooklyn Edison Company, died in Brooklyn Oct. 13.

Otto P. Diedrich, electrical engineer, Rochester, N. Y., died Oct. 26 at his home in that city after a long illness. Mr. Diedrich was born in Rochester 40 years ago. For the past ten years he had been engaged in the practice of electrical engineering.

Alfred G. Place, chief electrical engineer for the Youngstown Sheet & Tube Company, died at the Youngstown Hospital, Youngstown, Ohio, Oct. 25, after an illness of several months. Mr. Place first became identified with the Youngstown company in 1913 as electrical engineer. His ability soon obtained official recognition, resulting in his promotion to the head of the department. Mr. Place was born at Woburn, Mass., in 1887, and was educated at the Massachusetts Institute of Technology, having been graduated from that institution as an electrical engineer in the class of 1908. His first connection was with the Northwestern Power Company at Seattle, Wash., but subsequently he transferred his interests to Youngstown. Mr. Place was widely known in the electrical industry and at the time of his death was vice-president of the American Institute of Electrical Engineers.

James A. Smith, superintendent of the Schenectady plant of the General Electric Company for the last fifteen years, died Oct. 25 at his home in Schenectady, the victim of a stroke suffered the night before. Mr. Smith was born in Hartford, Conn., May 25, 1873, and worked on a farm when young. In 1888 he entered the employ of Pratt & Whitney in Hartford, Conn., about a year later entering the apprentice shop of that company. He was sent to Chicago to install the Pratt & Whitney exhibit at the World's Fair and, in 1900, was selected to install and demonstrate the company's exhibit at the Paris exposition. From 1901 to 1903 he was associated with the Niles-Bement-Pond Company and in 1905 was made superintendent of the Dutchess Tool Works at Fishkill Landing, N. Y., which position he held until he entered the employ of the General Electric Company in 1910. His first General Electric position was at the Schenectady plant as assistant to the mechanical superintendent. In a few months' time he was made superintendent of one of the shops. He became general superintendent of the plant in July, 1913.

Financial and Statistical News

Customer-Ownership Sales Quiet in August

Sales of electric light and power company stock to customers, employees and other local parties in August continued on the relatively low level established in July, a number of important companies that usually sell in considerable amounts reporting no sales at all or only very small quantities.

On the basis of the monthly reports received by the ELECTRICAL WORLD, the estimated total value of such sales was $7,390,000; the number of shares sold was 101,800 and the number of transactions 11,200. The average per transaction was therefore about $660. Approximately $6,000,000 of the whole value was in the form of $100 shares, the balance in lower-priced stocks, averaging a little less than $35 per share. In contrast to the usual situation, which generally reveals at least a few campaigns of major importance during any given month, there was no such activity in August. Only one report showed sales exceeding the $1,000,000 mark.

Consolidated Gas Increases Dividend Rate

Directors of the Consolidated Gas Company of New York declared a quarterly dividend of 75 cents a share on the common stock, placing the issue on a $3 annual basis. As this is the first dividend since the stock was split two for one, it is equal to a $6 annual dividend against the old rate of $5 paid since 1923. This dividend is equal to $11 a share on Brooklyn Edison Company stock, which was exchanged on the basis of one share of Brooklyn Edison for one share of Consolidated Gas $5 preferred and two shares of Consolidated Gas common. Brooklyn Edison formerly paid $8 a share. Consolidated Gas has outstanding at the present time 10,440,000 common shares, assuming that all Brooklyn Edison is exchanged. The new dividend basis, therefore, means an annual expenditure of $31,320,000 on the increased stock issue.

New England Power System Developing Rapidly

The New England Power Association has expanded materially during the present year and now supplies electricity in or to each state of this group except Maine, covering a territory of about 9,000 square miles. The system serves 257 communities, having a population of about 2,500,000. Its total output for the twelve months ended Sept. 30, 1928, was more than 1,293,000,000 kw.-hr. and more than 1,112,000,000 cu.ft. of gas. The combined electric generating capacity of its subsidiaries is 612,000 hp., of which 230,000 hp. is hydro-electric, and water rights are controlled totaling an additional 270,000 hp. More than 1,300 miles of high-tension transmission lines, largely 66 and 110 kv., and of steel tower construction are operated and more than 1,000 miles of distribution lines are now included in the system. On Oct. 24 the association had outstanding $25,000,000 in gold debentures and its preferred and common shares, based on quotations of that date, had a market value of more than $104,000,000. Forty-four per cent of its electric revenues are from domestic and commercial sales and street lighting, 34 per cent from industrial companies, 20 per cent from public utilities and 2 per cent from transportation companies.

Cabot Charges Government Forced Utilities to Hide Profits

WHETHER the Federal Trade Commission investigation is destined to raise American business standards or whether its effect will be harmful, due to suspicions being cast upon the utility industry, is one of the pertinent questions asked by Philip Cabot under the caption of "Ethics and Politics" in the November issue of the *Atlantic Monthly*. Since confidence is the foundation upon which all business rests, "few poisons," says Mr. Cabot, "are more deadly to a highly integrated industrial civilization like ours than suspicion." The subtle injection of the term propaganda into the investigation is an instance cited.

There are two pertinent problems, says the writer, which need to be solved. One arises out of the danger that monopoly in electric power supply will enable the producer to earn an excessive profit. The other is the danger that profit legitimately earned may be diverted into the wrong hands by manipulation within the holding companies. The first of these is disposed of as merely political bogey, which has been set up with a definite purpose. The power companies, it is pointed out, are legalized monopolies under the control of state-regulating commissions. Consequently, unless the state commissions utterly fail in their duty it is impossible for the operating companies to demand or receive an excessive price or to earn a monopoly profit.

Mr. Cabot goes even farther to point out that if such a thing as a power trust did exist it would be a blessing to the customers rather than a menace. The reader is intrigued at the end of the second section of the article by the statement: "Where there is so much smoke there should be some fire. There is fire; if you search you will find it, but those who are berating the holding companies are leading the public away from it. The fire is not in the corporation offices in Wall Street, but in the offices of the state-regulating commissions. The problem which really needs searching investigation is whether the regulation of rates by the state commissions is being intelligently and skillfully done."

Postponing pursuit of this theme for the moment, Mr. Cabot refers to an article which appeared in the September *Atlantic Monthly* under the name of Maurice R. Scharff and compares his viewpoints to the old doctrine of Calvinism which seems to infer the natural perversity both of the individual and of modern day corporations. Here the writer pauses to condemn the proposal set forth by Mr. Scharff for dictators in the power industry, which he says is based on the above-mentioned religious dogma. Mr. Cabot refuses to believe that public utility executives and other men are naturally dishonest, and this he interprets as the inference in the proposal of a power dictator.

Attention is then called to the fact that state commissions were appointed invariably to regulate rates rather than company profits. It is claimed that the commissions have fallen away from this latter purpose and have adopted the former. It is pointed out that public utilities are not monopolies so far as the price of their service is concerned. Power is produced in competition with potential power-producing customers and also with an almost infinite number of substitutes. Secondly, cost does not determine prices except under static conditions, such as do not exist in the electrical industry in America. On the contrary, price determines cost, says Mr. Cabot. In the third place the writer points out that profit is the incentive of private initiative and has made possible the phenomenal growth of the industry in this country.

GOVERNMENT TO BLAME FOR REVISION

Mr. Cabot next strikes at the heart of the argument by charging that if dishonesty exists in the power industry the government itself is to blame. The writer argues that power executives naturally use every weapon within their reach to maintain adequate profit and that the state commissions drove them to this action. He points out that the

Current Earnings Reports of Electric Light and Power Companies

	1928	1927	Per Cent Increase	Operating Ratio 1928	Operating Ratio 1927
Commonwealth Power (Year ended Sept. 30)					
Gross earnings	$56,962,150	$52,408,357	8.7	52	53
Net earnings	27,413,897	24,373,251	12.5	..	..
Consumers Power (Year ended Sept. 30)					
Gross earnings	29,338,990	26,149,680	12.2	50	51
Net earnings	14,641,257	12,708,574	15.2	..	..
Electric Power & Light Subs. (Year ended June 30)					
Gross earnings	53,550,186	51,352,288	4.3	54	56
Net earnings	24,275,510	22,677,022	7.1	..	..
Montana Power (Nine months ended Sept. 30)					
Gross earnings	7,646,374	7,000,775	9.2	33	38
Net earnings	5,045,995	4,466,284	12.9	..	..
Nevada-California Electric (Year ended Sept. 30)					
Gross earnings	5,371,693	5,157,985	4.1	44	42
Net earnings	3,071,546	2,805,418	9.5	..	..
Penn.-Ohio Edison & Subs. (Year ended Sept. 30)					
Gross earnings	$26,231,618	$25,668,117	2.1	59	64
Net earnings	10,557,652	9,207,384	14.6	..	..
Portland Electric Power (Year ended Sept. 30)					
Gross earnings	12,409,277	12,097,711	2.6	59	61
Net earnings	5,037,942	4,822,801	4.5	..	..
Southern California Edison (Nine months ended Sept. 30)					
Gross earnings	26,280,355	23,049,997	14.0	..	..
Net earnings	17,761,814	15,630,371	14.0	..	..
Tennessee Electric Power (Year ended Sept. 30)					
Gross earnings	13,154,672	12,406,318	6.0	53	54
Net earnings	6,214,063	5,734,793	8.4	..	..

old economic theory that "value in use" or price can be determined from the cost of the tool has resulted in the regulation of net income and the neglect of the other elements which really determine price. Thus naturally management endeavors to conceal real profit, and this is the charge now brought against holding companies. "No one can justify such proceedings by any ethical standards, but before we condemn those who resort to it we should consider who led them into temptation. If it is shown that some of the managers of these holding companies have been driven into devious courses it is the government which should hang its head." Mr. Cabot then points out that profits will naturally and inevitably vary according to the ability of management.

New Issues in October Total $81,745,000

OFFERINGS of new securities by the electric light and power companies totaled $81,745,000 during the month of October, as compared with $133,852,500 in September and $210,555,000 in October, 1927. October brought to a close the ten-month period with a total of $1,042,798,352, as against $1,258,071,200 for the similar period of 1927.

The utility field is merely following the general trend in this respect, new offerings of all types continuing at reduced levels. The compilation for September made by the *Commercial and Financial Chronicle* records a total of $428,184,035 for all new corporate issues in the United States, as compared with $451,363,942 for the month of September, 1927.

The largest individual loan was raised by the Cities Service Company in the form of gold debentures, priced at 97½ to yield 5.15 per cent, a piece of financing involving a total of $30,000,000. Attention is directed to the prominent part taken by preferred stock issues in the month's new financing. Of the sixteen new offerings issued eight were preferred stock. The new issues during October netted the investor an average yield of 5.47 per cent, as compared with 5.54 per cent in September. The new financing was long-term.

Security Issues of Electric Service Companies in October

Name of Company	Amount of Issue (Par Value)	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Birmingham Electric Co.	$3,000,000	40	First and refunding mortgage gold bonds	To reimburse for additions made or to be made	4½	92½	4.93
Arkansas Power & Light Co.	3,000,000	30	First and refunding mortgage gold bonds	To reimburse for additions made or to be made	5	96½	5.25
Green Mountain Power Corp.	3,822,000	..	Cumulative preferred stock	To acquire certain properties, for refunding purposes and to reimburse for the cost of constructing additions and improvements	6	98	6.12
American Community Power Co.	5,000,000	25	Secured gold debentures	To pay for common stock of other companies and for other corporate purposes	5½	94½	5.90
Engineers Public Service Co.	12,935,000	..	Cumulative preferred stock	To acquire stock of Puget Sound utility, to reduce notes payable and for other corporate purposes	5½	99½	5.52
Central States Utilities Corp.	2,328,000	..	Preferred stock	New capital	7	97	7.21
Long Island Lighting Co.	1,000,000	..	Cumulative preferred stock	To raise funds for additions, extensions and improvements to properties	6	103	5.82
Cities Service Co.	30,000,000	35	Gold debentures	To raise funds for property additions made and to be made by the company and subsidiaries	5	97½	5.15
Public Service Co. of New Hampshire	1,300,000	29	First and refunding mortgage gold bonds, series B	To reimburse for acquisition of new properties, for extensions to plant and equipment and for other corporate purposes	4½	93½	4.92
Public Utilities Consolidated Corp.	1,000,000	..	Cumulative preferred stock	For the acquisition of properties and for other corporate purposes	7	100	7
	1,750,000	20	First mortgage collateral convertible gold bonds		6½	100	6.50
Iowa Public Service Co.	735,000	..	Cumulative first preferred stock	To reimburse company for extensions, betterments and acquisition of properties	6	98	6.12
Electric Investors, Inc.	2,475,000	..	Preferred stock	To acquire additional interests in light and power companies and for other corporate purposes	6	99	6.06
Bellows Falls Hydro-Electric Corp.	9,000,000	30	First (closed) mortgage gold bonds	To finance construction work	5	98	5.12
Virginia Public Service Co.	3,000,000	18	First mortgage and refunding gold bonds, series A	To retire bonds and to reimburse for expenditures on additions, improvements and extensions	5½	97½	5.70
General Water Wks. & Electric Corp.	1,400,000	..	Cumulative preferred stock		7	100	7
Total	$81,745,000 (par value)			Rights	$14,943,600		
Total amount actually realized	79,822,595			Total financing for October	94,766,195		

Power Corporation of Canada Building Valuable Equity

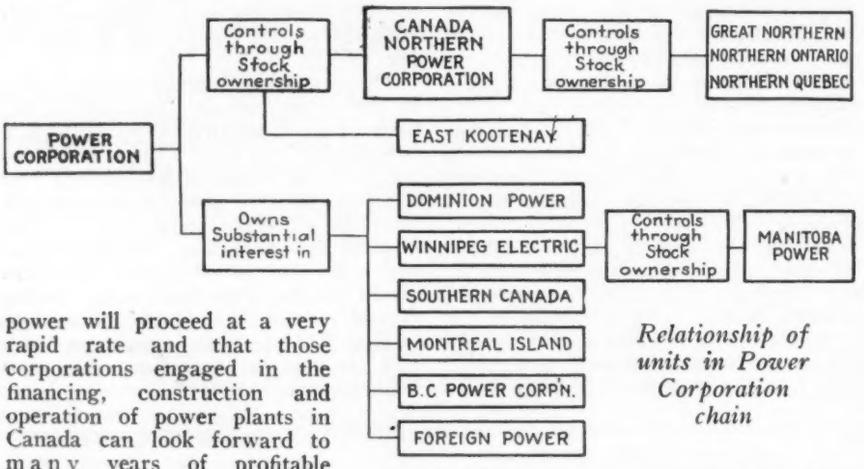
By A. D. Watts
Senior Partner A. D. Watts & Company

ONE of the most important factors in connection with Canada's undeveloped hydro-electric power sites is their location adjacent to large and important industrial centers; for instance, Montreal, Quebec, Toronto, Winnipeg and Vancouver each has more than a million hydro-electric horsepower within reasonable transmission distance. This situation, combined with the fact that nearly all of these cities have the added advantage of water transportation for the assembly of their raw materials and shipment of manufactured goods, means that the development of Canada's extensive water power will proceed at a very rapid rate and that those corporations engaged in the financing, construction and operation of power plants in Canada can look forward to many years of profitable activity.

The Power Corporation of Canada, which was incorporated in 1925, has grown rapidly and today holds a position in Canada comparable to that of the Electric Bond & Share Company and similar organizations in the United States. The company was formed as a holding company for electric light and power companies and also to finance, construct, operate and manage public utility properties. Therefore, it enjoys four separate and distinct sources of income, all of which should prove exceedingly profitable in a rapidly developing country such as Canada.

The Power Corporation also provides, for the use of a considerable number of large, medium and small public utility companies which could not otherwise maintain such service, the advantage of its experience and the expert advice of its organization. This advice and supervision make for low construction and operating costs for the various companies and give the Power Corporation a moderate profit for its services. It holds control or acts as fiscal agent for some of the largest Canadian companies operating hydro-electric power plants in Quebec, Ontario, Manitoba and British Columbia. These companies have a total installed capacity of almost 500,000 hp. and serve a population of about 1,000,000 people. Since its organization in 1925, earnings have expanded rapidly, as shown in the tabulation below.

Most of the above companies for the last five years have been forced to expand steadily, with the result that their capacity has been very considerably increased. In most cases a large portion of such expenditures have been made out of earnings. In addition, only very moderate dividends are being paid in order that large surplus may be established partly to care for future expansion; therefore, a very valuable equity is being built up behind their common stocks, which in due course will enable very much higher dividends to be paid, with a corresponding capital appreciation in the market value of these securities.



Relationship of units in Power Corporation chain

Canada has now entered into a period of prosperity which is expected to last for many years. This prosperity is based on the growth of agriculture and the development of the country's natural resources, such as hydro-electric power, pulp and paper, mining, and the supplying of raw materials to the various markets. Exceptional rail and water transportation, combined with large supplies of skilled labor, added to ample financial resources, insures its prosperity and therefore an organization like the Power Corporation, engaged in the financing, construction, operation and management of a prime necessity, power, at a reasonable cost, can also look forward with assurance to a long period of prosperity with steadily increasing profits as its operations increase in size.

Few people realize that mining is rapidly becoming the leading industry, next to agriculture, and as it is a well-established fact that this industry requires enormous amounts of power for the operation of air compressors, hoists, pumping, crushing, grinding, etc., its growth is a very important factor to most power companies in Canada. Furthermore, mining companies pay higher rates for power, and this produces a relatively higher income. Another very important point is that mines usually operate on a very high load factor and this helps the big companies to balance up their operations.

The Power Corporation of Canada is also an investment trust, and through its powerful affiliations in the banking, public utility and industrial fields is able to buy investment stocks at attractive levels, taking profits when large advances have occurred in market prices and switching into other equally good securities which have not yet appreciated.

	1928	1927	1926
Capital involved	$25,698,106	$9,920,246	$5,600,000
Net earnings	1,802,557	661,452	246,386
Earned per dollar of capital involved, *per cent*	7.01	6.66	4.39

New Investment Company Organized

Under the laws of Maryland there has just been organized for the purpose primarily of investing and dealing in securities of public utility operating and holding companies the International Superpower Corporation, with an authorized capital of 500,000 shares. The new investing company will purchase the stocks of those companies interested particularly in the generation, transmission or sale of electric energy. The board of directors includes Calvin Bullock, Denver, president United States Electric Light & Power Shares, Inc.; Chandler Bullock, Worcester, president State Mutual Life Assurance Company; F. D. Comerford, Boston, president New England Power Association; Rudolph B. Flershem, Buffalo; H. A. Hanning, New York, formerly manager public utilities division, Moody's Investors Service; W. T. Hincks, Bridgeport, Hincks Brothers & Company; W. R. Huntley, Buffalo, president Buffalo General Electric Company; Alfred Jaretzki, Jr., New York, Sullivan & Cromwell; Theodore G. Smith, New York, vice-president Central Union Trust Company of New York. Public offering of 50,000 shares of the capital stock of the company was made at $48 per share.

Cities Service Common on Twenty-Dollar-Par Basis. — The common stock of the Cities Service Company is at the present time on a twenty-dollar-par basis, having been changed from one hundred dollar par in 1925. The statement that the value of the stock was changed last year to no-par shares and also the accompanying chart (bar for 1927) published in the Oct. 27 issue of the Electrical World, page 866, were in error.

Business News and Market Conditions

Federal Reserve Finds Trade Volume Larger

THE volume of production and distribution of commodities increased seasonally in September, according to a summary of business and financial conditions issued this week by the Federal Reserve Board. Manufacturers' output exceeded that of any previous month this year and factory employment and payrolls also increased. Output of iron and steel and of automobiles was unusually large during the months of September and October, although there has recently been some curtailment of operation.

Building contracts awarded, after declining in volume for three months, exceeded all previous records for September. The increase was due chiefly to certain large contracts for industrial plants and subway construction. During the first three weeks of October awards exceeded those of the same period last year, the excess being especially large in the Eastern sections of the country.

The demand for bank credit for commercial purposes increased between the middle of September and the middle of October, reflecting seasonal activity in trade and the marketing of crops. There was also a growth in loans to brokers and dealers in securities, though total loans on securities of reporting member banks showed little change.

For the four weeks ended Oct. 24 a growth of about $40,000,000 in the total volume of reserve bank credit in use was due chiefly to continued increase in the demand for currency, offset in part by a small inflow of gold from abroad.

Orders for Electrical Goods Show 8 per Cent Rise

New orders booked during the third quarter of 1928 as reported to the Department of Commerce by 86 manufacturers of electrical goods were $264,419,328, as compared with $244,467,209 for the second quarter of 1928 and $235,847,857 for the third quarter of 1927. The accompanying totals of bookings for each quarter since the beginning of 1923 are presented, not as a complete statement of the industry but as probably sufficiently representative to indicate the trend.

ORDERS FOR ELECTRICAL GOODS

Quarter	1923	1924	1925	1926	1927	1928
First	$225,399,383	$228,760,838	$233,023,182	$262,677,736	$243,651,415	$242,875,462
Second	240,542,824	221,167,876	227,502,652	248,000,075	236,427,121	*244,467,209
Third	201,910,099	185,747,314	232,933,532	241,114,209	235,847,857	264,419,328
Fourth	218,165,415	231,470,552	244,597,050	260,078,082	239,999,298	.....
Total	$886,017,721	$867,146,580	$938,056,416	$1,011,870,102	$954,925,691	.....

* Revised.

Prices Continue Upward

Wholesale prices continued upward during September, according to the Bureau of Labor Statistics report. The bureau's weighted index number, computed on prices for 1926 as base and including 550 commodities, stands at 100.1 for September, against 98.9 for August. The figure for September, 1927, was 96.5, over which this year's figure shows a gain of nearly 3¾ per cent. Building material prices showed little change.

Copper Reaches 16 Cents After Heavy Sales

Heavy copper sales at advancing prices were again the feature of the non-ferrous metal markets in the week ended Wednesday, the market having reached 16 cents per pound, delivered. Tin is also stronger, but the other metals have been reasonably quiet at practically unchanged prices.

The heavy sales of last week have been duplicated this week, though some sellers have limited their offerings, with the result that the business has not been so well distributed among the different producers as before. On Oct. 25 another quarter of a cent advance was made, to 15¾ cents for Connecticut deliveries, but no cessation in demand resulted. Over the week-end the price advanced again to 16 cents, since which time the volume of sales has been smaller. One or two producers are now quoting 16¼ cents, but only one small lot has been reported sold at that price, and the sentiment among other sellers is against any further advance if it can be avoided.

Most of the copper sold has been for January delivery, and it is thought that consumers' requirements for that month must now be pretty well taken care of. A small percentage, however, has been for December or February. The principal activity is apparently in the wire and sheet business, though the brass mills are also doing a record business.

NEW YORK METAL MARKET PRICES

	Oct. 24, 1928 Cents per Pound	Oct. 31, 1928 Cents per Pound
Copper, electrolytic	15.50	16
Lead, Am. S. & R. price	6.50	6.50
Antimony	10¼	10¼
Nickel, ingot	35	35
Zinc, spot	6.60	6.60
Tin, Straits	48.50	49.425
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Oct. 31, 1928, 17¼ cents.

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

Division	September 1927	September 1928	Per Cent Increase or Decrease	Nine Months 1927	Nine Months 1928	Per Cent Increase or Decrease
New York	228	245	+ 7.46	2,869	2,669	— 7
Middle and Southern Atlantic	206	197	— 4.36	1,546	1,726	+11.6
New England	155	159	+ 2.58	1,404	1,194	—14.9
Pacific Coast	13	3	—77	152	113	—25.6
Central	718	619	—13.8	8,223	6,897	—16.1
Total	1,320	1,223	— 7.35	14,194	12,599	—11.2

TOTAL AMOUNTS REPORTED

	September 1927	September 1928	Per Cent Increase or Decrease	Nine Months 1927	Nine Months 1928	Per Cent Increase or Decrease
New York	$31,186	$33,904	+ 8.72	$451,547	$380,533	—15.7
Middle and Southern Atlantic	20,806	23,135	+11.1	182,846	219,580	+20
New England	20,213	17,754	—12.1	164,102	146,359	—10.8
Pacific Coast	1,233	464	—62.3	18,999	16,412	—13.6
Central	71,593	65,844	— 8.03	915,295	814,154	—11.1
Total	$145,031	$141,101	— 2.71	$1,732,789	$1,577,038	— 8.89

AVERAGE AMOUNTS

	September 1927	September 1928	Nine Months 1927	Nine Months 1928
New York	$137	$140	$1,426	$1,300
Middle and Southern Atlantic	101	117	1,068	1,144
New England	130	111	1,053	1,105
Pacific Coast	94	154	1,401	1,159
Central	100	106	1,015	1,059

Market Conditions

ONE of the most significant indications of the general confidence in present and future business conditions is the character of industrial buying that is going on throughout the country. Reports from all sections show that manufacturing concerns are going ahead steadily with expansions and improvements in their plant facilities. Much of the purchasing is of motor and control equipment, showing the trend toward more complete electrification of industry. Another significant indication is the extent of buying of transformers and substation equipment for industrial account, showing the trend toward purchase of power rather than its generation.

Among central-station companies equipment buying has been of the character needed to complete the year's construction program before severe weather sets in. Some companies are now making preliminary plans for setting up their construction budgets for 1929. In the appliance and merchandise lines holiday purchases are beginning to make their appearance.

Many Equipment Orders Placed on Pacific Coast

A well-balanced week of good orders is reported on the Pacific Coast, including such orders as a $20,000 General Electric switchboard for a Bay County substation, a $30,000 order for replacing parts and additional equipment for San Francisco's famous Path of Gold street-lighting system and arc-welding material aggregating $17,500 ordered by the Southern Pacific Company for shipment to various division points for use in track welding. The week's outstanding machinery order was received by Westinghouse and covers two each 75- and 175-hp. pumping motors, a thirteen-unit truck-type switching equipment and a bank of four house type transformers, 833 kva., 11,000 to 2,400 volts, all totaling $60,000. Power company prospective orders include 125,000 lb. of sizes Nos. 8 to 1 weatherproof wire, one carload of ¼ to 7/16-in. guy strand, 100,000 lb. of No. 3/0 bare copper wire for the city of Los Angeles, one carload of ⅜-in. single guy strand for Oakland, assorted carloads of poles for Niles, Sacramento and Fresno, 600 crossarms of 5-ft. size for Reno and $45,000 worth of lead-covered cable, principally 500,000 to 1,500,000-circ.mil sizes, for underground work in the Bay region. The exceedingly large prospective business includes the proposed Fokker-Richfield plane factory for Oakland, a $3,000,000 school bond issue for Los Angeles, the proposed United States ammunition depot, a factory and power plant for Hawthorne, Nev., and a $5,000,000 canning plant backed by the Sacramento Valley regional directors and to be built in either San Francisco or Sacramento.

Excellent street-lighting business is reported, including 125 duplex ornamental standards for the downtown district of Oakland, 16- and 32-standard extensions respectively for Vallejo and Richmond and a proposed thirteen-city block installation for Berkeley. The city of Tacoma awarded contracts for a fire alarm system costing about $60,000. Bids are being taken for a 750-kw. turbine for the lumber mill at Shelton, Wash., and for twenty motors, of 75-hp. down; six pumps from 750 gal. down and twelve fans from 100,000 cu.ft. per minute down, involving about $10,000, for a department store installation in Seattle and for twelve pumps for a chemical plant in Tacoma. The city of Seattle is taking bids for about $7,000 worth of conduit and 300 9-in. top cedar poles. The city of Spokane has appropriated $10,000 for traffic signals and is taking bids for 23,000 ft. of rubber-covered, lead-sheathed cable. The Boeing Airplane Company, Seattle, plans an expenditure of $10,000,000 within eighteen months for the expansion of a Seattle plant. The Pacific Coast Steel Company, Seattle, will spend $1,500,000 in improvements and the Keeley, Pleukharp Glass Company, Ltd., plans a $250,000 plant in New Westminster, B. C. Construction projects are as follows:

The General Petroleum Corporation, Los Angeles, plans a refining plant at Hermosa Beach, Calif., to cost $2,000,000. The Pacific Gas & Electric Company, San Francisco, plans an equipment storage and distributing plant in the Mission district to cost $100,000. The Rocky Mountain Packing Corporation, Murray, Utah, plans a meat-packing plant to cost $200,000. The Bureau of Reclamation, Denver, Colo., will receive bids until Nov. 17 for radial gates, radial gate hoists, etc., for power and irrigation development. Great Falls, Mont., and Phoenix, Ariz., plan ornamental lighting systems.

Heating Appliances Active in St. Louis District

Shipments of stock size motors and transformers in the St. Louis district have been slightly less for the past week, but sales of heating appliances are in better volume. Central-station buying for the month has been about 15 per cent below normal. A manufacturer of lighting fixtures reports one order of 2,000 units amounting to about $8,000 and another for fixtures to be installed in a convention hall amounting to $40,000. Both of these orders are for shipment to cities in the East. The demand for conduit wire and other construction materials continues as strong as previously reported. Construction projects are as follows:

Kansas City, Mo., plans an automatic traffic signal system to cost $250,000. Monette, Mo., plans an ornamental lighting system. St. Louis, Mo., plans a vocational high school to cost $3,000,000. The Oklahoma Gas & Electric Company, Oklahoma City, Okla., will install an ornamental lighting system at Shawnee, Okla. The Corona Silica Company, Inc., Rogers, Ark., plans the development of silica mines and a mill to cost $125,000. The Central Power & Light Company, San Antonio, Tex., will make extensions in its lighting system at Beeville, Tex. The Dallas Power & Light Company, Dallas, Tex., will increase capacity of its local steam-operated electric power plant and carry out other expansions to cost $2,750,000. The Houston Coca-Cola Bottling Company, Houston, Tex., will build an addition to cost $85,000. The Wackman Welded Ware Company, Houston, Tex., plans a plant to cost $70,000. The Gulf States Utilities Company, Beaumont, Tex., will build a 66,000-volt transmission line between Jennings and Lafayette, La.

Volume of Sales Increases in Middle West

The volume of business being transacted in the Middle West is increasing gradually from month to month. Present indications seem to point to continued prosperity during the last two months of the year. Reports from the steel and automotive industries show an excellent condition of business, while the railroad, agricultural and mining industries show improvement. Industrial activity is noticeably good and with the approach of the holiday season much seasonal activity is becoming apparent. The various utility companies have completed the majority of their line construction work and are now busy with maintenance work which will continue throughout the winter. Interesting orders placed include one return bend economizer complete with appurtenances, four 13,000-amp., 15-kv. synchronous booster converters, 33 current-limiting reactors and several construction orders valued at $60,000. Jobbers' sales continue satisfactory. Construction projects are as follows:

The Peoples' Ice & Fuel Company, La Crosse, Wis., plan an ice-manufacturing plant to cost $100,000. The Sparry Candy Company, Milwaukee, Wis., plans a factory to cost $100,000. The Michigan Steel Tube Products Company, Detroit, plans additions and improvements in its plant to cost $300,000. The Superintendent of Lighthouses, Detroit, will receive bids until Nov. 6 for ten 3-kw. oil engine-driven electric generators. The American Laundry Company, Grand Rapids, Mich., will build an addition to its power plant to cost $40,000. The Frost Gear & Forge Company, Jackson, Mich., plans an addition to cost $100,000. Borden's Farm Products, Inc., Chicago, plans a plant at Forest Park, Ill., to cost $80,000. The Hall Printing Company, Chicago, plans a plant to cost $500,000. The Stewart-Warner Speedometer Corporation, Chicago, plans an addition to its factory to cost $300,000. The Oldfield Engineering Company, Cicero, Ill., plans an addition to its mechanical equipment manufacturing plant, to cost $70,000. Bliss & Laughlin, Inc., Harvey, Ill., plan improvements in its machinery plant to cost $200,000. The Andrews Wire & Iron Works, Rockford, Ill., plans an addition to its plant to cost $75,000. Evansville, Ind., plans a municipal airport with shops and floodlighting system to cost $175,000. The Youngstown Sheet & Tube Company, Youngstown, Ohio, plans expansions at its

plant at Indiana Harbor, Ind., to cost $1,000,000. The Timken Roller Bearing Company, Canton, Ohio, plans a plant unit to cost $100,000. The Crown Overall Manufacturing Company, Cincinnati, plans a factory to cost $230,000. The Precision Casting Company, Syracuse, N. Y., plans a plant at Cleveland, Ohio, to cost $110,000. Warren, Ohio, plans a municipal airport with shops and flood lighting system to cost $50,000. The Minneapolis Knitting Works, Minneapolis, Minn., plans an addition to its textile mill to cost $100,000. Mapleton and St. Paul, Minn., Stoughton, Wis., Calumet City and Deerfield, Ill., plan ornamental lighting systems.

Prospective Business Encouraging in Eastern District

Early future business for electrical equipment is showing up in an encouraging manner in the Eastern district, based on the increasing volume of inquiries now being received from central-station companies and industrial interests. Immediate account has a tendency to be spotty. A maker of transformers reports trade as fair. An order has been received from a central-station company in Connecticut for transformers and accessory equipment for substation service, to cost $25,000. Another manufacturer of apparatus of this kind says that there is an improved call from industrial quarters. Switches, choke coils and other heavy substation equipment for central-station installations have found a fairly active market during the past few weeks.

The demand for industrial motors continues as a feature of market activities. According to a leading maker, sales are running ahead of this time a year ago and there is every indication for continuance on this level. There has been a good call for motors for woodworking machines, as well as for other machine tools. Units for laundry machinery are also operating under a good market. A prominent manufacturer of industrial electric equipment, including electric-operated crushers, etc., is closing a contract for an installation for a cement mill in the South to cost $200,000. This same maker reports a good demand for equipment for mining and refining plants.

Control apparatus is securing a fair volume of sales. Inquiries are holding up well and the outlook for commitments during the next 30 to 60 days is encouraging. There has been a good volume of transactions with metropolitan electrical contractors for school installations and other sizable jobs. Wire and cables show a tendency to reduced sales. Construction operations include the following:

The Durant Motors, Inc., New York, plans an addition to its plant at Toronto, Ont., to cost $200,000. The Fokker Aircraft Corporation, New York, plans expansions in plants at Hasbrouck Heights, N. J., and Wheeling, W. Va., to cost $200,000, and a new plant unit near Los Angeles, Calif., to cost $500,000. The Asiatic Petroleum Company, Ltd., New York, plans a storage and distributing plant at Tampa, Fla., to cost $100,000. The United States Gypsum Company, Chicago, plans a plant near Harrison, N. J., to cost $100,000. The New York Power & Light Corporation, Albany, will make extensions and improvements in transmission lines and substation to cost $835,000. The Texas Company, New York, plans oil refineries in Texas, to cost $1,500,000. The Joseph A. Sanders Roofing Company, Buffalo, N. Y., plans a plant to to cost $85,000. The Safety Fire Proofing Corporation, New York, plans a plant near Pulaski, Va., to cost $100,000. The Public Service Electric & Gas Company, Newark, N. J., plans a power substation at Bloomfield, N. J.

The Huck-Gerhardt Company, Inc., Philadelphia, plans a woodworking factory to cost $100,000. The Northern Pennsylvania Power Company, Binghamton, N. Y., plans extensions in transmission lines in Wayne and Susquehanna Counties, Pa. The Reading Full Fashioned Hosiery Mills, Reading, Pa., plans an addition to cost $100,000. Philadelphia is asking bids until Nov. 8 for electric lamps, etc., for street-lighting, and power for service for a twelve-month period. The A. M. Byers Company, Pittsburgh, plans a plant at Ambridge, Pa., to cost $500,000. Bartgis Brothers Company, Baltimore, plans a plant for the manufacture of paperboard products at Ilchester, Md., to cost $100,000. The District of Columbia, Washington, will soon take bids for extensions and improvements in the power plant at the Gallinger Hospital, to cost $60,000. The General Purchasing Officer, Panama Canal, Washington, will receive bids until Nov. 15 for transformers, switches, cable, wire, and other electrical supplies (Schedule 1915). The Bureau of Yards and Docks, Navy Department, Washington, is asking bids (no closing date stated) for one 1,000-kw. direct-current turbo-generator, with surface condenser, motor-driven pumps and accessories for the naval station at Annapolis, Md. (Specification 5629). The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until Nov. 15 for ammeters, switches, etc., for Eastern and Western yards (Schedule 9902).

New England Buying Reported Steady

Steady buying of small power equipment and schedule material marked the tone in the New England district. Small motor sales were encouraging. One lot of 125 motors was ordered and an order consisting of a number of sizes up to 50 hp. with switch and control apparatus amounting to over $6,500 was reported. Sales recorded by one prominent manufacturer reached about $38,000. Central-station equipment needs included orders for insulators and outside regulation and control equipment. One representative reported many orders for closing up numerous substation construction projects. Negotiations are increasing for new work ahead. Heavy power equipment interest is centered in a number of plant changes. An order for a 1,200 kw. turbo-generator and accessories was recently placed and negotiations will soon be closed for several large motor drive units.

Electric street lighting is active and new installations include a recent adoption of 600-cp. lights for Salem, Mass. Electric ranges are in demand. About $50,000 will soon be expended by a hospital for a complete baking assembly. The sale of a 40-kw. electric oven to a prominent preparatory school was noted.

Business in Southeast Quiet, but Inquiries Are Active

Conditions remain generally quiet in the Southeast. One central station placed an order for weatherproof solid and stranded copper wire amounting to $15,500, while another order for stranded copper totaled $7,900. Reasonably satisfactory business is reported in distribution and small power transformers, one company's orders for this equipment in the past ten days aggregating $8,900. Some other central-station orders reported are for $8,200 worth of strain insulators, secondary racks and pole line hardware amounting to $3,600 and watt-hour meters totaling $3,600. A number of textile mills are taking advantage of the slack period and are revamping equipment and adding some textile machinery and a reasonably good volume of orders is coming through. The Georgia cotton-mill has inquiries out on three 667-kva. transformers for one plant and three 833-kva. transformers for another. Some motors will probably be ordered at the time the transformers are. Another Georgia mill is in the market for ten 5-hp. individual spinning frame motors for use in connection with frames that were ordered. An order was placed for rigid conduit amounting to $2,000, and material orders aggregating $40,000 in connection with the construction of a theater building in Atlanta were placed. The Oconee Clay Products Company of Milledgeville Georgia has signed a contract covering the electrification of its lower plant and this work will involve electrical materials approximating $8,500. The Richmond Hosiery Mill of Rossville Georgia has announced plans for an addition to its plant to cost $200,000. Construction projects are as follows:

The Stuart Light & Power Company, Stuart, Va., plans extensions in transmission lines to Buffalo Ridge, Patrick Springs, Critz, Va., and vicinity. The West Virginia Hydro-Electric Company, Charlottesville, Va., plans a hydro-electric plant on the New River near Hinton, W. Va. The Champion Knitting Mills, Chattanooga, Tenn., plan extensions to cost $100,000. Creswell, N. C., plans a transmission line with substation equipment, distributing system, etc. The McClaren Rubber Company, Charlotte, N. C., will make improvements in its mill to cost $75,000. The Quartermaster Department, Marine Barracks, Parris Island, S. C., will receive bids until Nov. 12 for reflectors, batteries, wire and other electrical supplies. The South Carolina Power Company, Charleston, S. C., will extend transmission lines and rebuild the system at Walterboro, S. C. The Mississippi Power Company, Gulfport, Miss., plans a transmission line in the Blue Mountain district. The Gulf States Steel Company, Birmingham, Ala., will make expansions at its mill and properties at Alabama City, Ala., to cost $2,000,000. The Baker County Power Company, Camilla, Ga., plans extensions in transmission line with power substation equipment near Blakely, Ga. The Georgia Power & Light Company, Valdosta, Ga., plans a transmission line from Boston to Barwick, Pavo, Ga., and vicinity. The Tampa Union Terminal Company, Tampa, Fla., plans a fruit-canning and cold storage plant to cost $100,000.

Activities of the Trade

General Electric Sales Up 7 per Cent

General Electric Company sales billed for the first nine months of 1928 amounted to $242,676,762, compared with $225,959,610 for the corresponding period last year, President Gerard Swope has announced. Profit available for dividends on common stock for the first nine months of 1928 was

	1928	1927
Net sales billed	$242,676,762	$225,959,610
Less: Cost of sales billed, including operating maintenance and depreciation charges, reserves and provision for all taxes	213,350,235	198,796,918
Net income from sales	$29,326,527	$27,162,692
ther income, less interest paid and sundry charges	9,515,098	8,030,362
Profit available for dividends	$38,841,625	$35,193,054
Less: Cash dividends on special stock	1,930,975	1,930,813
Profit available for dividends on common stock (7,211,481 84/100 shares issued)	$36,910,650	$33,262,241

$38,841,625, compared with $35,193,054 for the same nine months last year.

A comparative statement of sales and earnings for the nine months is given in the above table.

The profit available for common stock for the nine months is equivalent to $5.12 per share in 1928 and $4.61 per share in 1927.

Allis-Chalmers Billings Show Increase of 6.70 per Cent

The comparative earnings statement of the Allis-Chalmers Manufacturing Company, Inc., for the first three-quarters of 1928 has been issued, showing sales billed and net profits by quarters, also unfilled orders on hand at the end of the quarter.

Billings for the current nine months show an increase of 6.70 per cent over the corresponding period a year ago. Net profit available for common dividens amounted to $2,223,631, equivalent to $8.55 per share, compared with $1,881,406 or $7.26 per share in the 1927 period. Bookings for the nine months of 1928 aggregated $26,679,724 compared with $23,521,893 for the similar period in 1927, an increase of 13.43 per cent. Unfilled orders on hand Sept. 30, 1928, amounted to $9,965,764, contrasted with $10,013,114 on Dec. 31, 1927.

ALLIS-CHALMERS MANUFACTURING COMPANY QUARTERLY EARNINGS STATEMENT

	Billings		Net Profit	
	1928	1927	1928	1927
First quarter	$8,415,253	$7,906,355	$675,600	$561,460
Second quarter	8,979,358	8,666,873	804,407	543,237
Third quarter	9,337,924	8,479,653	743,623	776,709
Total nine months	$26,732,535	$25,052,881	$2,223,630	$1,881,406

Westinghouse Arc-Welding Laboratory Nears Completion

The Westinghouse Electric & Manufacturing Company is just completing at the East Pittsburgh Works of the company the largest arc-welding laboratory in the world. It is 170 ft. long, 75 ft. wide and 40 ft. high and contains the latest developments in arc-welding apparatus.

The equipment of the laboratory includes a 15-ton crane and massive rolling and forming equipment to be used in forming and shaping the various parts that, when welded together, will form turbo-generator frames, locomotive frames, synchronous motor frames and spiders, boxes, machinery bases, floor plates and tanks, miscellaneous machinery parts, industrial heating apparatus, steel pipes and shop furniture.

Large generators, motors and other apparatus which for years have been constructed of immense castings, many tons in weight, are now being formed of pieces of standard structural steel, welded together. At the present time a 26-ton turbine generator frame, entirely welded, is being fabricated in the Westinghouse welding laboratory. This generator, one of the largest in the country, will be installed in a New York station of the United Electric Light & Power Company.

Adequate Tariff for Electrical Products

Present Method of Evaluating Imports Unsatisfactory—Onus of Correcting Situation Rests on Manufacturers

SO FAR as the electrical manufacturing industry is concerned the present method of evaluating imports is unsatisfactory, according to an address made by Thomas Allen, chairman of the N.E.M.A. tariff committee, delivered at the fall meeting of the National Electrical Manufacturers' Association at Briarcliff Lodge this week. Under the tariff act of 1922, Mr. Allen pointed out, the foreign valuation basis is used, whereas American valuation would be much fairer to all concerned. Almost all of the products being imported which affect the electrical manufacturing industry come in under the foreign valuation basis. Dealing with the consequences of this situation Mr. Allen said:

This method of valuation has caused a great deal of trouble, because for obvious reasons it is very difficult in many instances to find the wholesale market value in the country of origin. In many cases of material imported into this country there is no such wholesale value, and then it becomes necessary for the government to determine the cost of production in the country of origin, adding certain amounts for profit, shipping, insurance, etc. This, of necessity, has to be done by getting the cost of the foreign manufacturers, who object to it, and consequently differences of opinion arise as to what the real cost or values are in the country of origin. The other form of valuation which it is contended is the most equitable and should be the proper basis for all tariff legislation is known as the American valuation. The very first tariff act was entirely on this basis. In the second tariff act it was changed to the foreign valuation, it is believed largely at the instigation of the importers.

Amplifying this statement, Mr. Allen proceeds to show the difficulty of comparing the costs in this country with those abroad. It is necessary, for example, to study the labor and material contents of the product, the rates and wages paid here and abroad and, if possible, the cost of production by foreign manufacturers. This, Mr. Allen pointed out, is necessary on the part of manufacturers who are now suffering from foreign competition and who wish their case to be taken up in the next revision of the tariff. It is then necessary when the tariff hearings are on in Washington to have representatives who can present specific cases and answer questions of the ways and means committee or the Senate finance committee in regard to the particular product. In case of appeal on the part of importers with a view to lowering the tariff the government appraisers are not in a favorable position to argue the case unless they have the position of the American manufacturers in detail to sustain the appraiser. The N.E.M.A. tariff committee believes that each section of the industry should be willing to furnish witnesses to the government to sustain the government's position where it appears to be right. Speaking on behalf of the N.E.M.A. tariff committee, Mr. Allen concludes:

We will endeavor to assist you as far as we can; but unless you are willing to obtain the information properly to present your case in Washington you will let the matter go by default and will have to take the consequences after the next tariff act is passed.

THE RAILWAY & INDUSTRIAL ENGINEERING COMPANY, Greensburg, Pa., announces that W. M. McCauley, for-

merly in charge of the company's Pittsburgh office, has been appointed special representative with headquarters at Greensburg. W. R. Calverly, who has been associated with the company since 1915, has been appointed manager of the Pittsburgh office. Robert R. Stevenson, formerly chief engineer of the Electrical Development & Machine Company, Philadelphia, has been appointed district manager of the Philadelphia office and E. O. Geiler will assist Mr. Stevenson.

General Electric Buys Metropolitan-Vickers

It has been announced that the General Electric Company, through its British subsidiary, the British Thomson-Houston Company, obtained control of the Metropolitan-Vickers Electrical Company. The British Thomson-Houston Company will acquire the Metropolitan-Vickers and associate it with the Edison Swan and the Ferguson Pailin companies, which it already controls. Metropolitan-Vickers is capitalized at $30,000,000.

Although all this represents the taking over of control of a British company by American interests, a majority of shares, including voting shares, will be allowed to remain with British holders.

Westinghouse Shows Increasing Profits

The statement of the Westinghouse Electric & Manufacturing Company for the six months ended Sept. 30 compares with the same period of last year as follows:

	1928	1927
Orders received	$92,292,986	$86,939,386
Sales billed	90,771,958	84,181,604
*Net income	10,961,221	7,226,233
Interest charges	753,493	751,894
Net profit	$10,207,728	$6,474,339

Quarter ended Sept. 30:

	1928	1927
Orders received	$48,044,850	$46,188,716
Sales billed	48,529,399	43,771,124
*Net income	6,749,853	4,093,369
Interest charges	376,733	375,044
Net profit	$6,373,120	$3,718,325

*After depreciation and federal taxes.

Bookings in quarter ended Sept. 30 totaled $48,044,850 compared with $44,248,136 in the previous quarter and $46,188,716 in the three months ended Sept. 30, 1927.

Billings totaled $48,529,399 compared with $42,242,559 in the quarter ended June 30, last, and $43,771,124 in the quarter ended Sept. 30, 1927.

THE DESPATCH OVEN COMPANY, Minneapolis, Minn., announces that it has plans for the erection of a new factory for the manufacture of ovens for all purposes.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY announces that its switchboard and panelboard divisions are being consolidated into one section. The sales, engineering and manufacturing headquarters of the new division will be in Brooklyn, N. Y. R. F. Frenger, former automatic switching section head, has been appointed as sales head of the new division. J. L. Wagoner, formerly panelboard head in the Pittsburgh office, has been appointed as head inquiry man under Mr. Frenger.

THE ELECTRIC VACUUM CLEANER COMPANY, INC., Cleveland, announces a new accessory, the "Premier" sprayer. Although designed primarily for use with the "Premier" duplex, the sprayer can be made to fit the attachments of practically every standard household cleaner. The sprayer is made of the highest grade materials with a heavy nickel-plated finish.

THE WESTERN ELECTRIC COMPANY plans the erection of a manufacturing plant on the site of River View Park, Baltimore, Md., and an additional 75 acres to be acquired from the Canton Company, estimated to cost $15,000,000.

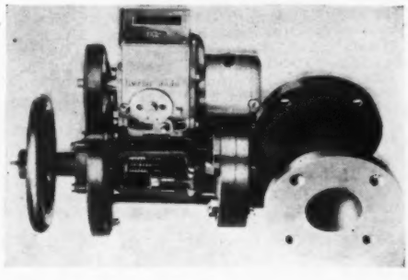
THE VAN DORN ELECTRIC TOOL COMPANY, Cleveland, announces that R. M. Porter has been appointed to its sales force to cover the Philadelphia and Camden, N. J., territory with headquarters at Philadelphia. R. F. Hutt has been placed in charge of the field covered by the Minneapolis office and will be located in Minneapolis.

New Equipment Available

Motor-Driven Mechanism for Operating Valves

A new motor-driven valve-operating unit has just been announced by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., which makes possible automatic operation of all valves up to 6 in.

Although so small that it can be held



in one hand, this unique operating unit has a rating of 15 lb.-ft. It can be operated automatically by means of float switches, temperature controlling devices, pressure regulators, etc., or by conveniently located push buttons.

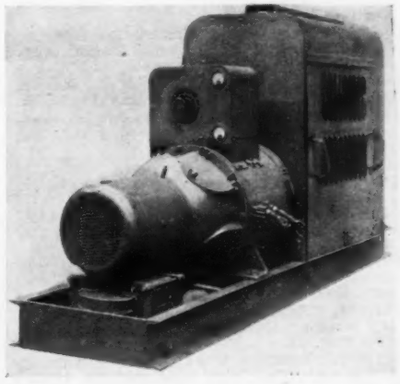
While designed primarily for valve-operating service in industries where regulation of pressures and temperatures of gases and fluids is necessary, it is likewise adaptable to many miscellaneous applications, such as operating skylights, awnings, radiators, garage doors, etc.

PROTECTIVE COATING FOR GALVANIZED METAL.—"Gun-Metal Liquid" is applied to galvanized iron by dipping or by a brush treatment. No heat is required for treatment. It is claimed that this liquid forms an instant union with the zinc and that an excess coating is also formed which adheres firmly to the surface, effectively protecting it from corrosion. Results in the field covering experiments over a period of several years have demonstrated that the paint will adhere to the treated galvanized iron and that the paste will adhere to treated poster advertising signs. This liquid, which is a compound of antimony, should be particularly useful on galvanized substation structures that are exposed to the destructive action of gases, smoke, brine, etc., in some geographical and industrial locations. This product is being produced and marketed by Liquid Metal Products, Inc., Chicago, under the Arent antimony patents.

Gas-Engine-Driven Arc-Welding Set

A self-contained, gas-engine-driven arc-welding set has been recently developed by the Westinghouse Electric & Manufacturing Company. It has been designed particularly for pipe line construction, structural steel work, railroad construction and general welding service in isolated places not having electric power available.

The complete set consists of a model P-20 Continental gas engine direct-connected to a new type Westinghouse 200-amp. arc-welding generator, with direct-connected exciter overhung from the generator bracket. The engine and



generator, complete with all controls, are mounted on an all-welded channel iron base. The equipment may be made suitable for stationary or portable use.

Electrical Patents

Announced by U. S. Patent Office

(Issued Oct. 16, 1928)

1,687,490. LATCH SWITCH; S. F. Briggs and and E. N. Jacobi, Milwaukee, Wis. App. filed Oct. 15, 1920.

1,687,491. SYNCHRONIZING CLOCK; J. W. Bryce, Bloomfield, N. J. App. filed June 26, 1924.

1,687,492. ELECTRIC WELDING APPARATUS; A. Churchward, New York, N. Y. App. filed Aug. 8, 1924.

1,687,496. INCANDESCENT LAMP; E. Henkel, Treptow, Berlin, and H. Wolff, Berlin, Germany. App. filed Nov. 8, 1927.

1,687,501. CONTROL MECHANISM FOR HOISTS, LIFTS AND THE LIKE; H. W. C. Liddiard, Rugby, England. App. filed March 31, 1926.

1,687,504. PRECISION-BASING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES; T. O. Moffit, Chicago, Ill. App. filed Feb. 19, 1926.

1,687,508. CONTROLLER; C. L. Perry, Schenectady, N. Y. App. filed Feb. 18, 1926.

1,687,510. ELECTRIC-LAMP BULB; M. Pipkin, Cleveland Heights, Ohio. App. filed June 29, 1925.

1,687,512, 1,687,513. ROTOR; H. G. Reist, Schenectady, N. Y. App. filed Jan. 13, 1928.

1,687,515. CIRCUIT INTERRUPTER; F. Roberson, Gary, Ind. App. filed April 9, 1926.

1,687,521. ELECTRIC HEATER; E. Stallworth, Americus, Ga. App. filed Dec. 19, 1927.

1,687,525. FLAMEPROOF ELECTRIC INSULATION AND METHOD OF PRODUCING THE SAME; E. G. Sturdevant, Oak Park, Ill. App. filed Dec. 9, 1924.

1,687,530. AUTOMATIC CUT-OUT FOR ELECTRIC INCANDESCENT LAMPS; I. H. Van Horn and W. A. Pipkin, East Cleveland, Ohio. App. filed March 11, 1924.

1,687,544. ELECTRIC FAN AND HEATER; J. E. Clark and T. E. Clark, Detroit, Mich. App. filed Nov. 16, 1925.

1,687,555. RECORDING APPARATUS FOR RELAYS; E. Gasiorowski, Hermsdorf, Berlin, Germany. App. filed Oct. 28, 1926.

1,687,560. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed April 6, 1923.

1,687,564. AUTOMATIC CONTROL OF DYNAMO-ELECTRIC MACHINES; J. I. Hull, Schenectady, N. Y. App. filed July 15, 1926.

1,687,569. TWO-WAY-SOCKET UNIT; W. Ile, Jackson, Mich. App. filed Dec. 12, 1925.

1,687,575. ELECTRIC MEASURING SYSTEM; K. Lubowsky, Berlin, Germany. App. filed Dec. 2, 1926.

1,687,585. MEANS FOR SUPPRESSING HARMONICS; J. A. O'Neil, Lynn, Mass. App. filed May 16, 1924.

1,687,611. ELECTRIC SWITCH; L. Hamer, Montreal, Quebec, Can. App. filed Jan. 10, 1924.

1,687,624. RELAY; P. MacGahan, East Pittsburgh, Pa. App. filed June 10, 1925.

1,687,628. RHEOSTAT; A. F. Martin, Rochester, N. Y. App. filed May 10, 1924.

1,687,629. CIRCUIT INTERRUPTER; W. E. McCoy, New York, N. Y. App. filed April 14, 1920.

1,687,637. ELECTRICAL CENTERING DEVICE; A. B. Reynders, Springfield, Mass. App. filed Nov. 10, 1922.

1,687,640. REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed May 11, 1925.

1,687,641. FLUID-PRESSURE TANK; C. Aalborg, Pittsburgh, Pa. App. filed Feb. 26, 1921.

1,687,642. CIRCUIT INTERRUPTER; C. Aalborg, Pittsburgh, Pa. App. filed Feb. 26, 1921.

1,687,648. INDUCTION REGULATOR; M. Gelman and F. Urschler, Sr., Pittsburgh, Pa. App. filed Aug. 20, 1924.

1,687,652. ELECTRIC HEATING SYSTEM FOR CARS; B. O. Austin, East Pittsburgh, Pa. App. filed Aug. 9, 1927.

1,687,654. ELEVATOR CONTROL SYSTEM; E. M. Bouton, East Pittsburgh, Pa. App. filed Feb. 16, 1922.

1,687,657. TROLLEY BASE; L. F. Burnham, Pittsburgh, Pa. App. filed Oct. 10, 1925.

1,687,664. THERMOSTAT; L. J. Greenawalt, Mansfield, Ohio. App. filed June 23, 1926.

1,687,676. ELECTRIC FURNACE; R. B. Lincoln, Wilkinsburg, Pa. App. filed Feb. 16, 1927.

1,687,677. RESISTOR AND METHOD OF MAKING THE SAME; G. M. Little, Pittsburgh, Pa. App. filed Sept. 27, 1922.

1,687,686. TEMPERATURE - COMPENSATING DEVICE; P. Paschen, Nuremberg, Germany. App. filed July 23, 1925.

1,687,692. ELECTRICAL METERING SYSTEM; R. T. Pierce, East Pittsburgh, Pa. App. filed Jan. 2, 1924.

1,687,700. PLANT WORKING WITH INDUCTION MOTOR FED FROM SYNCHRONOUS PHASE CONVERTER; K. von Kandó, Budapest, Hungary. App. filed April 22, 1925.

1,687,718. ELECTRIC-LAMP SOCKET; E. E. Falbe and Q. Rohrer, Cornell, Wis. App. June 14, 1926.

1,687,750. CONDUIT CLAMP; J. C. Boyton, Cleveland, Ohio. App. filed Nov. 21, 1923.

1,687,752. BATTERY PLATE; R. L. Ellery, Toledo, Ohio. App. filed Nov. 1, 1926.

1,687,759. INSULATOR-KNURLING DEVICE; M. F. H. Gouverneur, Baltimore, Md. App. filed Aug. 18, 1927.

1,687,762. MICROUPLER; F. P. Hall, Newark, N. J. App. filed June 16, 1926.

1,687,835. SAFETY SWITCH; A. E. Griswold, Seattle, Wash. App. filed Dec. 27, 1926.

1,687,855. REGULATOR SYSTEM; J. H. Ashbaugh, Pittsburgh, Pa. App. filed Dec. 4, 1924.

1,687,858. ELECTRICAL HEATER; F. C. Curtis, London, England. App. filed June 6, 1927.

1,687,868. ELECTRICAL APPARATUS; R. H. Langley, Schenectady, N. Y. App. filed June 10, 1922.

1,687,902. CIRCUIT ALARM; M. H. Schoenberg and L. Schon, San Francisco, Calif. App. filed March 10, 1924.

1,687,912. INSULATED CONDUCTOR; E. B. Wheeler, New York, N. Y. App. filed March 27, 1924.

1,687,925. METALLURGICAL FURNACE; A. J. Briggs, Syracuse, N. Y. App. filed Oct. 16, 1926.

1,687,936. ELECTRIC FURNACE AND METHOD OF OPERATION; A. E. Greene, Medina, Wash. App. filed May 18, 1925.

1,687,937. ELECTRIC FURNACE AND ELECTRODE CRANE; A. E. Greene, Medina, Wash. App. filed Nov. 20, 1920.

1,687,999. CONTROLLER CONSTRUCTION; E. Wirz, A. Haller and K. Kuntze, Baden, Switzerland. App. filed May 5, 1927.

1,688,002. STORAGE-CELL CONNECTER; T. S. Cole, New Haven, Conn. App. filed July 20, 1923.

1,688,005. IGNITION DEVICE; C. B. Dicksee, Wilkinsburg, Pa. App. filed June 6, 1924.

1,688,011. INSULATOR; M. F. H. Gouverneur, Victor, N. Y. App. filed Sept. 8, 1921.

1,688,015. INSULATOR; K. A. Hawley, New York, N. Y. App. filed Sept. 8, 1921.

1,688,038. PROTECTIVE DEVICE; A. M. Curtis, East Orange, N. J. App. filed April 30, 1926.

1,688,073. PRIMARY CELL; C. A. Gillingham, Lakewood, Ohio. App. filed Jan. 21, 1926.

1,688,078. SWITCH PANEL; W. E. Hawley, Pittsburgh, Pa. App. filed July 25, 1923.

1,688,108. ELECTRIC HOT-WATER HEATER; B. Berger, New York, N. Y. App. filed Jan. 16, 1928.

1,688,124. INFRA-RED-RAY GENERATOR; H. P. MacLagan, Oak Park, Ill. App. filed Jan. 3, 1927.

1,688,168. WALL-TYPE ELECTRIC HEATER; A. Whittaker, Windsor, Ont., Can. App. filed Oct. 9, 1925.

1,688,179. HAND SIGNAL LIGHT; H. G. Essman, New York, N. Y. App. filed Oct. 24, 1925.

1,688,182. TERMINAL CONNECTER; G. W. Fitzgerald, Union, Iowa. App. filed April 14, 1926.

1,688,189. RECTIFIER SYSTEM; E. Kern, Wettingen, Switzerland. App. filed Aug. 10, 1927.

1,688,201. ELECTRIC STEAM BOILER AND METHOD OF OPERATING THE SAME; N. J. Neall, Brookline, and R. W. Chadbourn, Melrose, Mass. App. filed Nov. 5, 1924.

1,688,202. ELECTRODE FOR ELECTRIC BOILERS; N. J. Neall, Brookline, and R. W. Chadbourn, Melrose, Mass. App. filed Nov. 5, 1924.

1,688,217. FLUID-POLE ELECTRIC SWITCH; J. Whalen, Omaha, Neb. App. filed Oct. 15, 1926.

1,688,245. REMOVABLE EMANATION SEED; J. Muir, New York, N. Y. App. filed Sept. 2, 1926.

1,688,270. ELECTRIC AIR-HEATING FURNACE; W. Doherty, West Philadelphia, Pa. App. filed Sept. 27, 1926.

1,688,286. ELECTRIC HEATING VESSEL; L. Reichold, Winsted, Conn. App. filed June 11, 1926.

1,688,303. FLEXIBLE ELECTRIC CONDUCTOR; H. C. Carpenter, Elizabeth, N. J. App. filed July 25, 1925.

1,688,307. APPARATUS FOR REMOVING LARGE-SIZED PARTICLES AND AGGREGATES FROM CERTAIN FINELY-DIVIDED POWDERS AND THE LIKE; G. Gallie and B. D. Porritt, London, England. App. filed March 20, 1926.

1,688,308. ELECTRICAL AREA-MEASURING DEVICE; D. E. Harding, Melrose, Mass. App. filed March 14, 1927.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

New Trade Literature

SINGLE-PHASE MOTORS.—The Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, has issued bulletin No. 157 describing its large RA single-phase repulsion-induction motors. The bulletin gives illustrations and detailed descriptions of every part of the motor.

LANTERN FLOODLIGHTS. — Circular No. 257 issued by the Electric Service supplies Company, Seventeenth and Cambria Streets, Philadelphia, describes its ornamental street lantern floodlights for the illumination of gasoline service stations. The company also is distributing circular No. 259 covering its "Golden Glow" lantern floodlights and contains illustrations showing the lighting effect produced by the "Golden Glow" lantern floodlights.

FLUSH PLATES.—The General Electric Company, merchandise department, Bridgeport, Conn., is distributing bulletin GED-230 describing and illustrating its "Textolite" flush plates with stippled finish.

PLIERS AND LIVE LINE TOOLS. — Bulletin No. 2 issued by the Master Plier Corporation, Forest Park, Ill., describes and illustrates the Master pliers. The company also has issued bulletin No. 3, covering its live line equipment. It contains illustrations showing the method of handling live line maintenance work with the Master pole unit.

ARC WELDING.—The Lincoln Electric Company, Colt Road and Kirby Avenue, Cleveland, has published a supplement to its text book "Arc Welding—The New Age in Iron and Steel." The booklet is entitled "How to Begin the Application of Arc Welding in Production Manufacturing" and is devoted to the redesign of machinery and the principles involved.

PERMAFLECTORS. — The Pittsburgh Reflector Company, 304 Ross Street, Pittsburgh, is distributing a pocket catalog which describes and illustrates its line of permaflectors for use in the lighting of show windows, cove lighting, direct and indirect lighting, floodlighting and color lighting. Attention also is called to its "Easy-to-Install" conduit system.

SOLDERLESS CONNECTORS. — The Delta-Star Electric Company, 2400 Block Fulton Street, Chicago, has issued a price sheet covering its rigid stud compression type solderless connectors.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency are desired in Alexandria, Egypt (No. 34,081), for battery charging sets and storage batteries for automobiles.

Purchase is desired in Habana, Cuba (No. 33,976), of electric coffee mills.

An agency is desired in Dresden, Germany (No. 33,978), for electric high-frequency induction ovens for smelting of brass, bronze and other metals.

Any manufacturer desiring to establish agencies abroad may consult with the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce, where data on available agencies throughout the world are on file.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Big Plants and Small

THE progressive replacement of small public utility plants by fewer, larger and more efficient ones is a matter of common knowledge.

What may not be so well known is the rapidity of the process, which is going on at such a rate that the total number is actually decreasing, despite the uninterrupted growth in the aggregate installed capacity.

In 1928 the rating of the average public utility plant in the United States was nearly two-and-a-half times as great as in 1920. The data are contained in the reports of the United States Geological Survey, which compiles monthly statistics for all public utility plants, including railway and Bureau of Reclamation, rated at 100 kw. or larger. At the beginning of 1920 there were 4,283 of these plants and their rated capacity was 13,093,972 kw. The average rating, therefore, was about 3,060 kw. per plant. At the beginning of 1928 the corresponding figures were 3,740 plants, 27,690,891 kw., and 7,400 kw. per plant. In the eight years the number had decreased, but the aggregate capacity had more than doubled.

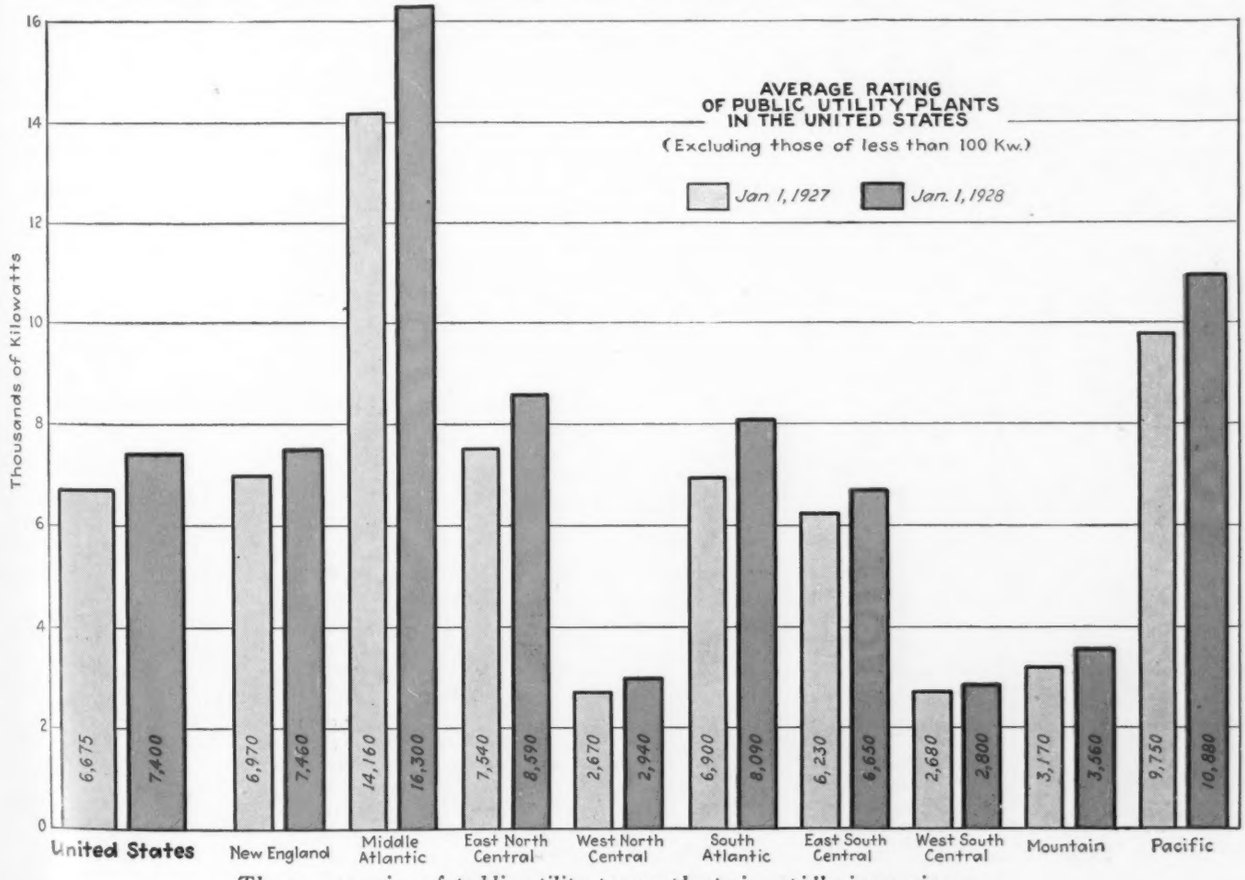
The growth is apparent even from statistics for consecutive years, as those for the beginning of 1927 and of 1928 published in the ELECTRICAL WORLD for April 28, 1928, on page 890; it is to be discovered in every part of the United States.

For the country as a whole the average installation at the beginning of 1928 had 11 per cent more kilowatts than at the beginning of 1927. In the Middle Atlantic States the gain was 15 per cent; that is, a change from 14,160 to 16,300 kw.

As might be expected, the sizes differ greatly in different parts of the country. The congested population centers of the East are necessarily served by big plants. The agricultural states west of the Mississippi have more plants than are found in the industrialized states in the eastern part of the valley, but they are, on the average, much smaller. The Pacific coast has large plants and long transmission systems.

But whatever may be the local conditions as to size, each section shows the inevitable increase.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers to quote or use them for any legitimate purpose. While no acknowledgment is required, users will, by crediting the ELECTRICAL WORLD, help it in obtaining and compiling further basic information.



The average size of public utility power plants is rapidly increasing

Southern Manufacturing Under Last Year

REPORTS received by the ELECTRICAL WORLD upon the consumption of electrical energy by about 550 large manufacturing plants operating in the Southern States indicates that September rate of operations was slightly under that of last year. Southern manufacturing operations have been under those reported for the same month last year ever since last March, although the seasonal trend during that period has followed that of last year very closely.

September manufacturing operations, after corrections are made for the number of working days, were 8.2 per cent over August and 6.8 per cent under September of last year. The average operations for the first nine months of the current year were 3.5 per cent under the same period last year.

The textiles and lumber industries of the South continue to report operations materially under those of last year. The textile plants have been reporting a rate of operations under that of the same month in the year previous ever since last December. September operations were 21 per cent under September last year, although a gain of 23.4 per cent over the current August. The average rate of operations during the first nine months of the year was 21 per cent over that during the same period in 1927. Reports indicate a real picking up in operations during October, but it seems probable that during the remaining months of the year the rate of operations in the textile plants will continue under those of last year.

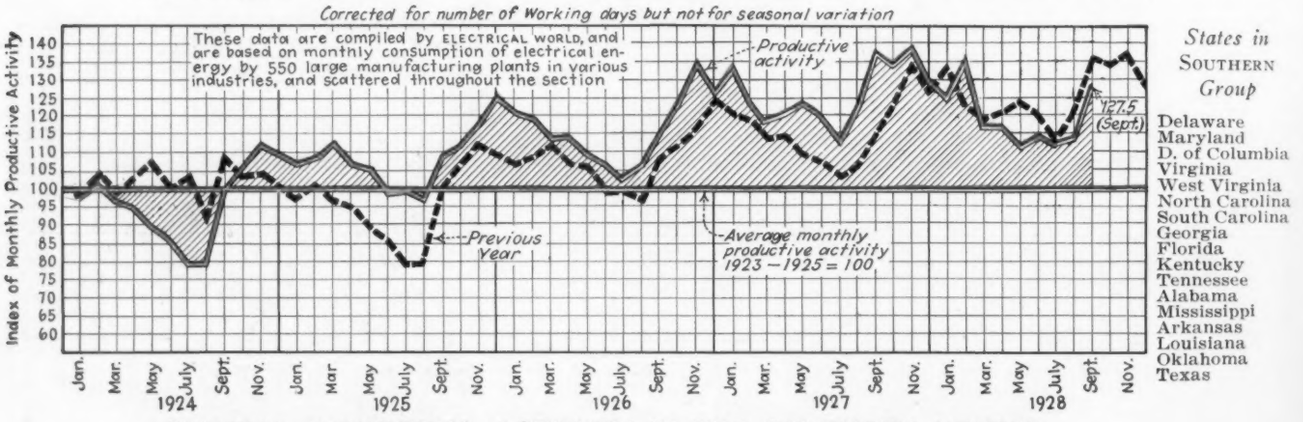
Index of Productive Activity in the Southern States

Average Monthly 1923-25 = 100

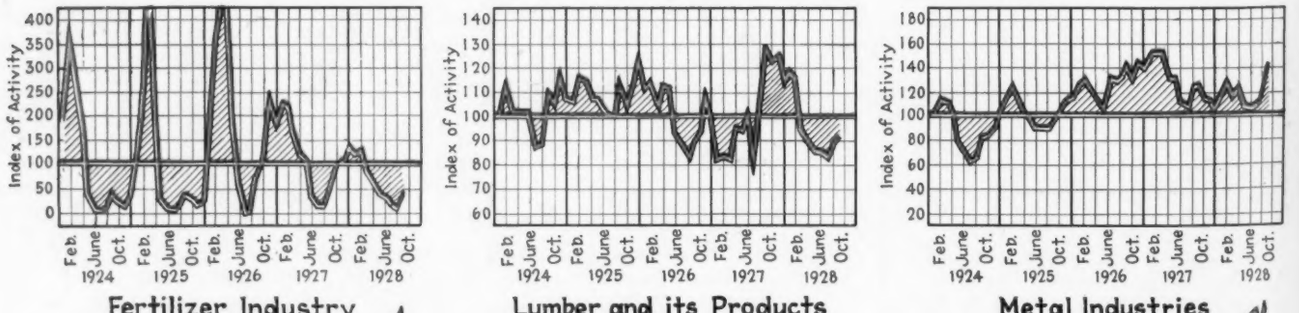
All Figures Adjusted for Number of Working Days

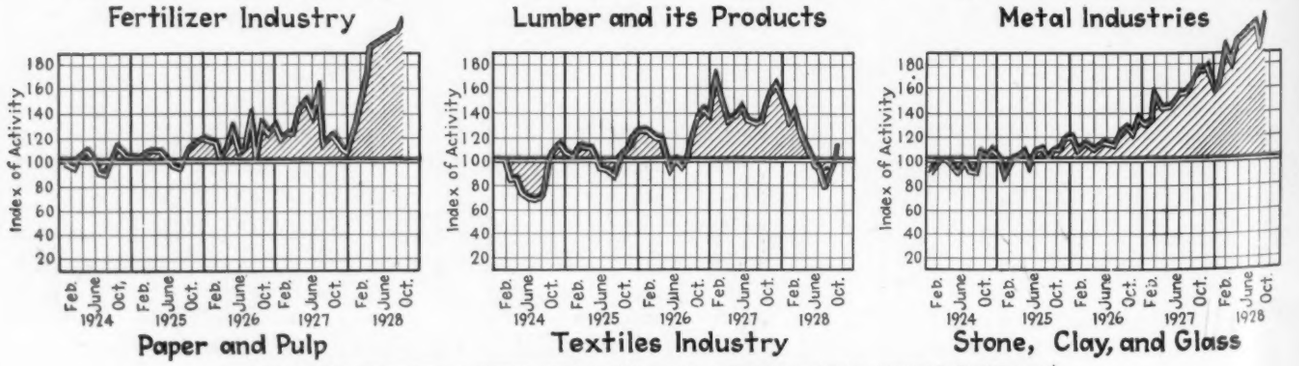
	September, 1928	August, 1928	September, 1927	Average First Nine Months 1928	Average First Nine Months 1927
All industry	127.5	112.8	136.8	118.6	122.9
Metal industries group	142.8	116.2	124.2	117.9	131.3
Rolling mills and steel plants	159.5	116.7	137.8	130.7	138.0
Metal-working plants	124.8	115.4	110.7	104.5	.....
Food and kindred products	124.8	120.0	129.4	124.0	.....
Stone, clay and glass	242.5	209.0	175.0	201.9	151.8
Textiles	117.7	95.2	148.4	112.4	142.1
Paper and pulp	237.5	219.5	120.7	194.2	132.8
Lumber and its products	91.4	89.2	129.9	94.6	95.9
Fertilizer industry	49.3	16.9	48.8	63.2	109.6
All industry (United States)	134.5	120.8	118.4	121.6	115.4

ELECTRICAL WORLD *Barometer of Industrial Activity in the Southern States*



GENERAL INDUSTRIAL ACTIVITY IN THE SOUTHERN STATES





PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE SOUTHERN STATES